Yocto-Relay, User's guide

Table of contents

1. Introduction **1**
- 1.1. Prerequisites 1
- 1.2. Optional accessories 3

2. Presentation **5**
- 2.1. Common elements 5
- 2.2. Specific elements 6

3. Electrocution hazards **9**
- 3.1. Dangerous components 9

4. First steps **11**
- 4.1. Localization 11
- 4.2. Test of the module 11
- 4.3. Configuration 12

5. Assembly and connections **15**
- 5.1. Fixing 15
- 5.2. Assembly examples 16
- 5.3. Electro-magnetic relays and coils 16
- 5.4. USB power distribution 16

6. Programming, general concepts **19**
- 6.1. Programming paradigm 19
- 6.2. The Yocto-Relay module 20
- 6.3. Module control interface 21
- 6.4. Relay function interface 22
- 6.5. What interface: Native, DLL or Service ? 23
- 6.6. Programming, where to start? 25

7. Using the Yocto-Relay in command line **27**
- 7.1. Installing 27
- 7.2. Use: general description 27
- 7.3. Control of the Relay function 28
- 7.4. Control of the module part 28

7.5. Limitations 29

8. Using Yocto-Relay with Javascript 31
8.1. Getting ready 31
8.2. Control of the Relay function 31
8.3. Control of the module part 33
8.4. Error handling 36

9. Using Yocto-Relay with PHP 39
9.1. Getting ready 39
9.2. Control of the Relay function 39
9.3. Control of the module part 41
9.4. HTTP callback API and NAT filters 44
9.5. Error handling 47

10. Using Yocto-Relay with C++ 49
10.1. Control of the Relay function 49
10.2. Control of the module part 51
10.3. Error handling 53
10.4. Integration variants for the C++ Yoctopuce library 54

11. Using Yocto-Relay with Objective-C 57
11.1. Control of the Relay function 57
11.2. Control of the module part 59
11.3. Error handling 61

12. Using Yocto-Relay with Visual Basic .NET 63
12.1. Installation 63
12.2. Using the Yoctopuce API in a Visual Basic project 63
12.3. Control of the Relay function 64
12.4. Control of the module part 65
12.5. Error handling 67

13. Using Yocto-Relay with C# 69
13.1. Installation 69
13.2. Using the Yoctopuce API in a Visual C# project 69
13.3. Control of the Relay function 70
13.4. Control of the module part 71
13.5. Error handling 74

14. Using Yocto-Relay with Delphi 77
14.1. Preparation 77
14.2. Control of the Relay function 77
14.3. Control of the module part 79
14.4. Error handling 81

15. Using the Yocto-Relay with Python 83
15.1. Source files 83
15.2. Dynamic library 83
15.3. Control of the Relay function 83
15.4. Control of the module part 85
15.5. Error handling 87

16. Using the Yocto-Relay with Java 89

16.1. Getting ready 89
16.2. Control of the Relay function 89
16.3. Control of the module part 91
16.4. Error handling 93

17. Using the Yocto-Relay with Android 95
17.1. Native access and VirtualHub 95
17.2. Getting ready 95
17.3. Compatibility 95
17.4. Activating the USB port under Android 96
17.5. Control of the Relay function 98
17.6. Control of the module part 100
17.7. Error handling 105

18. Advanced programming 107
18.1. Event programming 107

19. High-level API Reference 109
19.1. General functions 110
19.2. Module control interface 134
19.3. Relay function interface 179

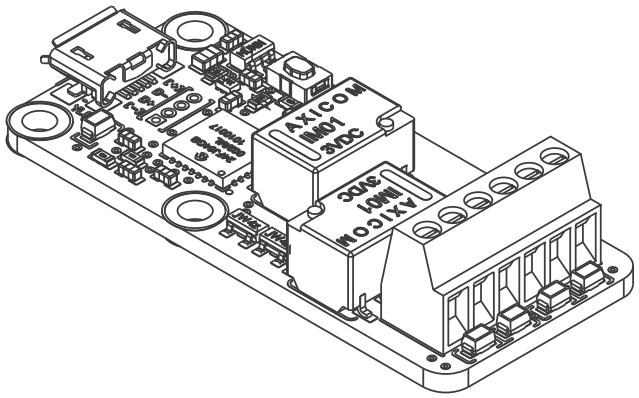
20. Troubleshooting 219
20.1. Linux and USB 219
20.2. ARM Platforms: HF and EL 220

21. Characteristics 221
Blueprint 223

Index 225

1. Introduction

The Yocto-Relay module is a small 45x20mm module which allows you to control small relays by USB. These relays can commute up to 160V and 2A, which allows you to pilot numerous equipments by acting directly on their power supply. The module small dimensions enable it to be slipped almost anywhere, including inside the piloted equipment.



The Yocto-Relay module

Yoctopuce thanks you for buying this Yocto-Relay and sincerely hopes that you will be satisfied with it. The Yoctopuce engineers have put a large amount of effort to ensure that your Yocto-Relay is easy to install anywhere and easy to drive from a maximum of programming languages. If you are nevertheless disappointed with this module, do not hesitate to contact Yoctopuce support[1].

By design, all Yoctopuce modules are driven the same way. Therefore, user's guides for all the modules of the range are very similar. If you have already carefully read through the user's guide of another Yoctopuce module, you can jump directly to the description of the module functions.

1.1. Prerequisites

In order to use your Yocto-Relay module, you should have the following items at hand.

A computer

Yoctopuce modules are intended to be driven by a computer (or possibly an embedded microprocessor). You will write the control software yourself, according to your needs, using the information provided in this manual.

[1] support@yoctopuce.com

Yoctopuce provides software libraries to drive its modules for the following operating systems: Windows, Mac OS X, Linux, and Android. Yoctopuce modules do not require installing any specific system driver, as they leverage the standard HID driver[2] provided with every operating system.

Windows versions currently supported are: Windows XP, Windows 2003, Windows Vista, and Windows 7. Both 32 bit and 64 bit versions are supported. Yoctopuce is frequently testing its modules on Windows XP and Windows 7.

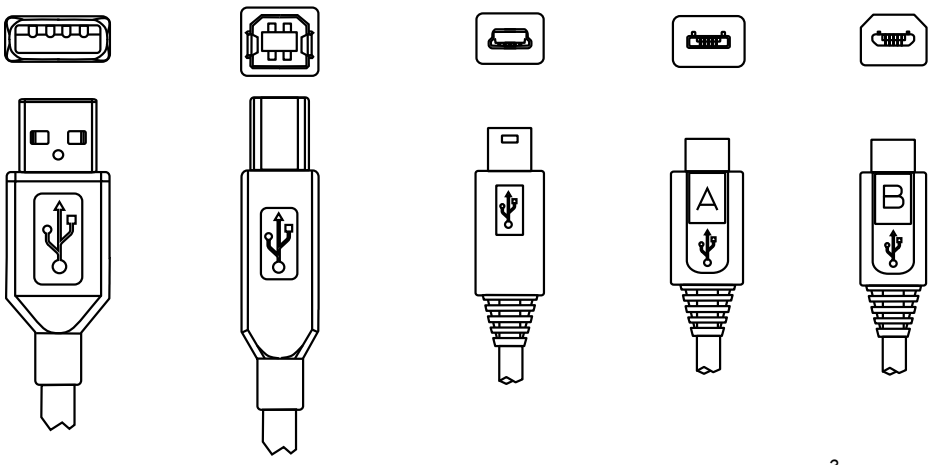
Mac OS X versions currently supported are: 10.6 (Snow Leopard), Mac OS X 10.7 (Lion), and 10.8 (Mountain Lion). Yoctopuce is frequently testing its modules on Mac OS X 10.6 and 10.7.

Linux kernels currently supported are the 2.6 branch and the 3.0 branch. Other versions of the Linux kernel, and even other UNIX variants, are very likely to work as well, as Linux support is implemented through the standard **libusb** API. Yoctopuce is frequently testing its modules on Linux kernel 2.6.

Android versions currently supported are: Android 3.1 and later. Moreover, it is necessary for the tablet or phone to support the *Host* USB mode. Yoctopuce is frequently testing its modules on Android 4.x on a Nexus 7 and a Samsung Galaxy S3 with the Java for Android library.

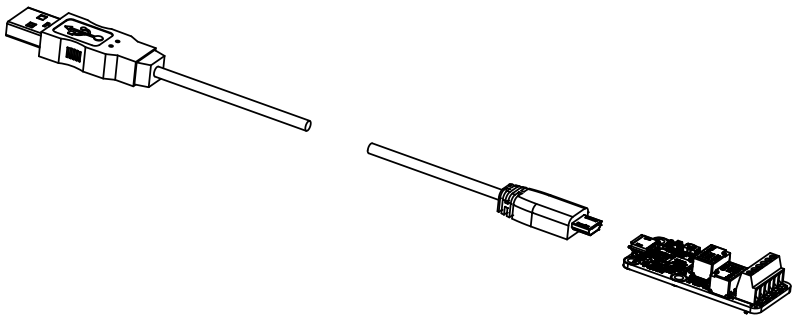
A USB cable, type A-micro B

USB connectors exist in three sizes: the "standard" size that you probably use to connect your printer, the very common mini size to connect small devices, and finally the micro size often used to connect mobile phones, as long as they do not exhibit an apple logo. All USB modules manufactured by Yoctopuce use micro size connectors.



The most common USB 2 connectors: A, B, Mini B, Micro A, Micro B.[3]

To connect your Yocto-Relay module to a computer, you need a USB cable of type A-micro B. The price of this cable may vary a lot depending on the source, look for it under the name *USB A to micro B Data cable*. Make sure not to buy a simple USB charging cable without data connectivity. The correct type of cable is available on the Yoctopuce shop.



You must plug in your Yocto-Relay module with a USB cable of type A - micro B.

[2] The HID driver is the one that takes care of the mouse, the keyboard, etc.
[3] *Although they existed for some time, Mini A connectors are not available anymore http://www.usb.org/developers/Deprecation_Announcement_052507.pdf*

If you insert a USB hub between the computer and the Yocto-Relay module, make sure to take into account the USB current limits. If you do not, be prepared to face unstable behaviors and unpredictable failures. You can find more details on this topic in the chapter about assembly and connections.

1.2. Optional accessories

The accessories below are not necessary to use the Yocto-Relay module but might be useful depending on your project. These are mostly common products that you can buy from your favourite hacking store. To save you the tedious job of looking for them, most of them are also available on the Yoctopuce shop.

Screws and spacers

In order to mount the Yocto-Relay module, you can put small screws in the 2.5mm assembly holes, with a screw head no larger than 4.5mm. The best way is to use threaded spacers, which you can then mount wherever you want. You can find more details on this topic in the chapter about assembly and connections.

Micro-USB hub

If you intend to put several Yoctopuce modules in a very small space, you can connect them directly to a micro-USB hub. Yoctopuce builds a USB hub particularly small for this purpose (down to 20mmx36mm), on which you can directly solder a USB cable instead of using a USB plug. For more details, see the micro-USB hub information sheet.

YoctoHub-Ethernet and YoctoHub-Wireless

You can add network connectivity to your Yocto-Relay, thanks to the YoctoHub-Ethernet and the YoctoHub-Wireless. The YoctoHub-Ethernet provides Ethernet connectivity and the YoctoHub-Wireless provides WiFi connectivity. Both can drive up to three devices and behave exactly like a regular computer running a *VirtualHub*.

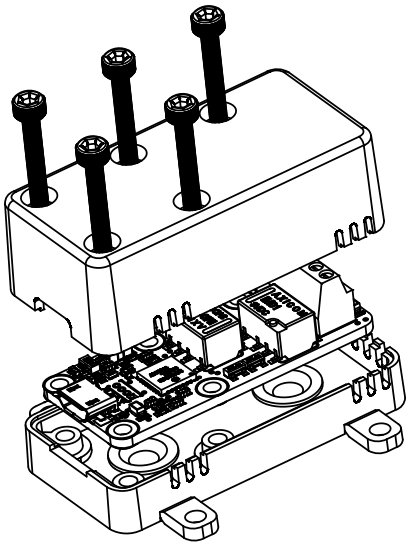
Solid copper ribbon cable

If you wish to solder the Yocto-Relay module directly to a micro-USB hub to save on the space used by USB cables, consider using solid copper ribbon cable: it is much easier to solder. In any case, you will need cable with 4 wires with 1.27mm pitch.

Enclosures

Your Yocto-Relay has been designed to be installed as is in your project. Nevertheless, Yoctopuce sells enclosures specifically designed for Yoctopuce devices. These enclosures have removable mounting brackets and magnets allowing them to stick on ferromagnetic surfaces. More details are available on the Yoctopuce web site [4]. The suggested enclosure model for your Yocto-Relay is the YoctoBox-Short-Thick-Black.

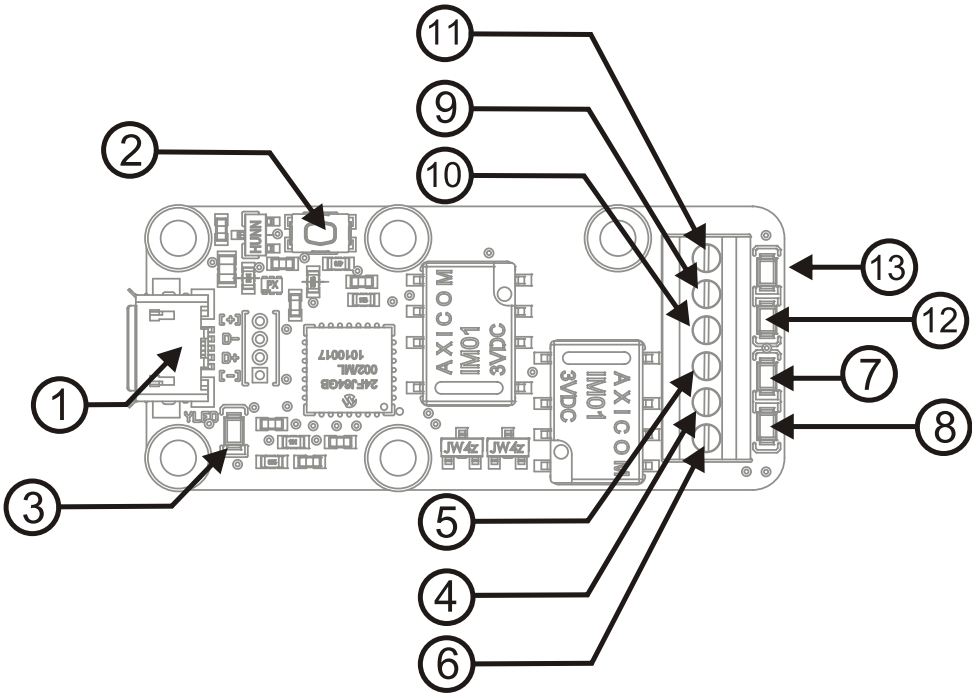
[4] http://www.yoctopuce.com/EN/products/category/enclosures



You can install your Yocto-Relay in an optional enclosure

In some cases, the magnets included in the enclosure base might interfere with the Yocto-Relay working. If that happens, just remove the magnets from the base, as described in the enclosure documentation

2. Presentation



1: USB socket
2: Yocto-button
3: Yocto-led
4: Input of relay 1
5: Output A of relay 1
6: Output B of relay 1
7: Output A led of relay1
8: Output B led of relay 1
9: Input of relay 2
10: Output A of relay 2
11: Output B of relay 2
12: Output A led of relay 2
13: Output B led of relay 2

2.1. Common elements

All Yocto-modules share a number of common functionalities.

USB connector

Yoctopuce modules all come with a micro-B USB socket. The corresponding cables are not the most common, but the sockets are the smallest available.

Warning: the USB connector is simply soldered in surface and can be pulled out if the USB plug acts as a lever. In this case, if the tracks stayed in position, the connector can be soldered back with a good iron and using flux to avoid bridges. Alternatively, you can solder a USB cable directly in the 1.27mm-spaced holes near the connector.

Yocto-button

The Yocto-button has two functionalities. First, it can activate the Yocto-beacon mode (see below under Yocto-led). Second, if you plug in a Yocto-module while keeping this button pressed, you can then reprogram its firmware with a new version. Note that there is a simpler UI-based method to update the firmware, but this one works even in case of severely damaged firmware.

Yocto-led

Normally, the Yocto-led is used to indicate that the module is working smoothly. The Yocto-led then emits a low blue light which varies slowly, mimicking breathing. The Yocto-led stops breathing when the module is not communicating any more, as for instance when powered by a USB hub which is disconnected from any active computer.

When you press the Yocto-button, the Yocto-led switches to Yocto-beacon mode. It starts flashing faster with a stronger light, in order to facilitate the localization of a module when you have several identical ones. It is indeed possible to trigger off the Yocto-beacon by software, as it is possible to detect by software that a Yocto-beacon is on.

The Yocto-led has a third functionality, which is less pleasant: when the internal software which controls the module encounters a fatal error, the Yocto-led starts emitting an SOS in morse [1]. If this happens, unplug and re-plug the module. If it happens again, check that the module contains the latest version of the firmware, and, if it is the case, contact Yoctopuce support[2].

Current sensor

Each Yocto-module is able to measure its own current consumption on the USB bus. Current supply on a USB bus being quite critical, this functionality can be of great help. You can only view the current consumption of a module by software.

Serial number

Each Yocto-module has a unique serial number assigned to it at the factory. For Yocto-Relay modules, this number starts with RELAYLO1. The module can be software driven using this serial number. The serial number cannot be modified.

Logical name

The logical name is similar to the serial number: it is a supposedly unique character string which allows you to reference your module by software. However, in the opposite of the serial number, the logical name can be modified at will. The benefit is to enable you to build several copies of the same project without needing to modify the driving software. You only need to program the same logical name in each copy. Warning: the behavior of a project becomes unpredictable when it contains several modules with the same logical name and when the driving software tries to access one of these modules through its logical name. When leaving the factory, modules do not have an assigned logical name. It is yours to define.

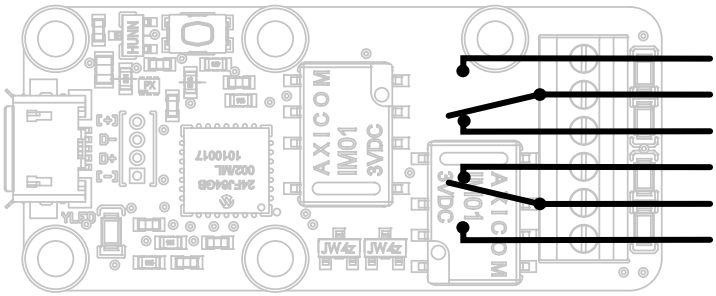
2.2. Specific elements

Screw terminal

The two relays embedded in the Yocto-Relay module are commutators, which means that they can commute their input current onto one of two outputs. This is why the terminal has six poles. When the

[1] short-short-short long-long-long short-short-short
[2] support@yoctopuce.com

module is powered off, the outputs A are active. Be aware: the outputs A and B are wired in mirror for relay 1 and 2.



Relay wiring inside the module.

Leds indicating the active outputs

On the front of the terminal, there are four green leds which indicate which module outputs are active. By default, the light of these leds is rather strong, but you can modify the luminosity.

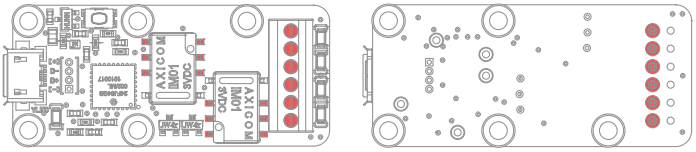
3. Electrocution hazards

While the Yocto-Relay module is perfectly able to manage a 160V voltage, we strongly discourage you to work on a voltage high enough to present risks. Nevertheless, if you decide to override this advice, respect these recommendations, they may well protect you from an embarrassing nomination to the Darwin Awards.

- Use your head, your luck won't last forever.
- Don't work if you are tired. Brilliant decisions taken at 2 a.m. tend to lose their shine at first light.
- Do not work under the influence of euphoriant substances. Beware of family reunions, they are known for their large amount of die-offs among the DIY population.
- Don't work alone. If things go bad, you can then hope to be rescued fast enough.

3.1. Dangerous components

Some components of the Yocto-Relay module find themselves directly on the relay working tension. Make sure to never touch them when the module is powered on. These components must never be in contact with a conductive component of your project (look out for metallic enclosures). Even more important, make sure that your project end user can never touch these components, even accidentally.

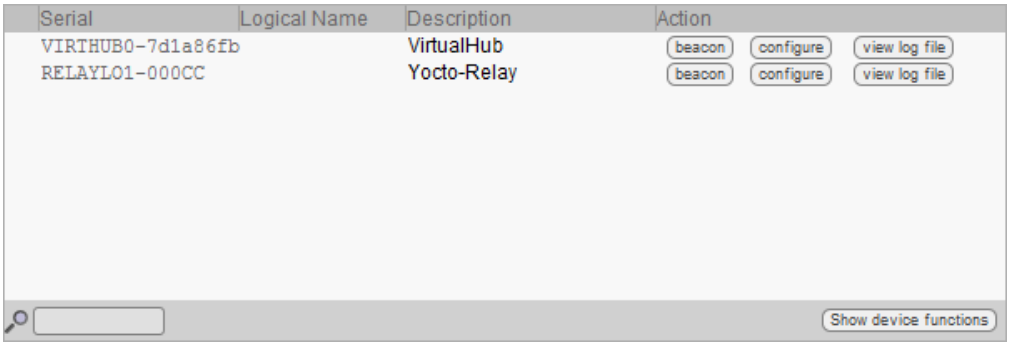


Potentially dangerous components of the Yocto-Relay module

4. First steps

When reading this chapter, your Yocto-Relay should be connected to your computer, which should have recognized it. It is time to make it work.

Go to the Yoctopuce web site and download the *Virtual Hub* software[1]. It is available for Windows, Linux, and Mac OS X. Normally, the Virtual Hub software serves as an abstraction layer for languages which cannot access the hardware layers of your computer. However, it also offers a succinct interface to configure your modules and to test their basic functions. You access this interface with a simple web browser[2]. Start the *Virtual Hub* software in a command line, open your preferred web browser and enter the URL *http://127.0.0.1:4444*. The list of the Yoctopuce modules connected to your computer is displayed.



Module list as displayed in your web bowser.

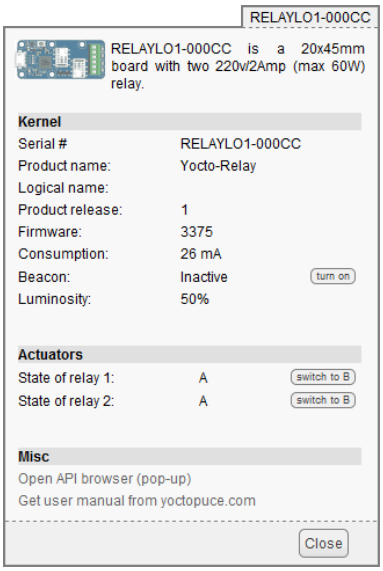
4.1. Localization

You can then physically localize each of the displayed modules by clicking on the **beacon** button. This puts the Yocto-led of the corresponding module in Yocto-beacon mode. It starts flashing, which allows you to easily localize it. The second effect is to display a little blue circle on the screen. You obtain the same behavior when pressing the Yocto-button of the module.

4.2. Test of the module

The first item to check is that your module is working well: click on the serial number corresponding to your module. This displays a window summarizing the properties of your Yocto-Relay.

[1] www.yoctopuce.com/EN/virtualhub.php
[2] The interface was tested on FireFox 3+, IE 6+, Safari, and Chrome. It does not work with Opera.

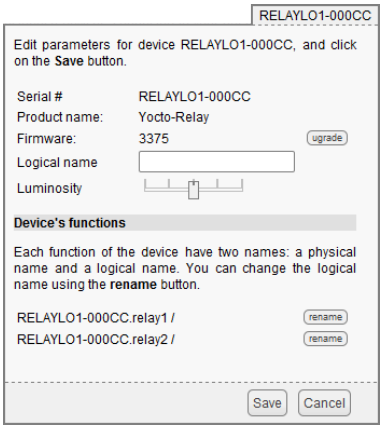


Properties of the Yocto-Relay module.

This window allows you, among other things, to test the module relays with the **switch to A** / **switch to B** buttons. There is a characteristic clicking when the relays are working. Moreover, the leds indicating the active outputs light up. Notice that the module consumption varies according to the activated outputs.

4.3. Configuration

When, in the module list, you click on the **configure** button corresponding to your module, the configuration window is displayed.


RELAYLO1-000CC
Edit parameters for device RELAYLO1-000CC, and click on the Save button.
Serial # RELAYLO1-000CC
Product name: Yocto-Relay
Firmware: 3375 ugrade
Logical name
Luminosity
Device's functions
Each function of the device have two names: a physical name and a logical name. You can change the logical name using the rename button.
RELAYLO1-000CC.relay1 / rename
RELAYLO1-000CC.relay2 / rename
Save
Cancel

Yocto-Relay module configuration.

Firmware

The module firmware can easily be updated with the help of the interface. To do so, you must beforehand have the adequate firmware on your local disk. Firmware destined for Yoctopuce modules are available as .byn files and can be downloaded from the Yoctopuce web site.

To update a firmware, simply click on the **upgrade** button on the configuration window and follow the instructions. If the update fails for one reason or another, unplug and re-plug the module and start the update process again. This solves the issue in most cases. If the module was unplugged while it was being reprogrammed, it does probably not work anymore and is not listed in the interface. However, it is always possible to reprogram the module correctly by using the *Virtual Hub* software [3] in command line [4].

[3] www.yoctopuce.com/EN/virtualhub.php
[4] More information available in the virtual hub documentation

Logical name of the module

The logical name is a name that you choose, which allows you to access your module, in the same way a file name allows you to access its content. A logical name has a maximum length of 19 characters. Authorized characters are A..Z, a..z, 0..9, _, and -. If you assign the same logical name to two modules connected to the same computer and you try to access one of them through this logical name, behavior is undetermined: you have no way of knowing which of the two modules answers.

Luminosity

This parameter allows you to act on the maximal intensity of the leds of the module. This enables you, if necessary, to make it a little more discreet, while limiting its power consumption. Note that this parameter acts on all the signposting leds of the module, including the Yocto-led. If you connect a module and no led turns on, it may mean that its luminosity was set to zero.

Logical names of functions

Each Yoctopuce module has a serial number and a logical name. In the same way, each function on each Yoctopuce module has a hardware name and a logical name, the latter can be freely chosen by the user. Using logical names for functions provides a greater flexibility when programming modules.

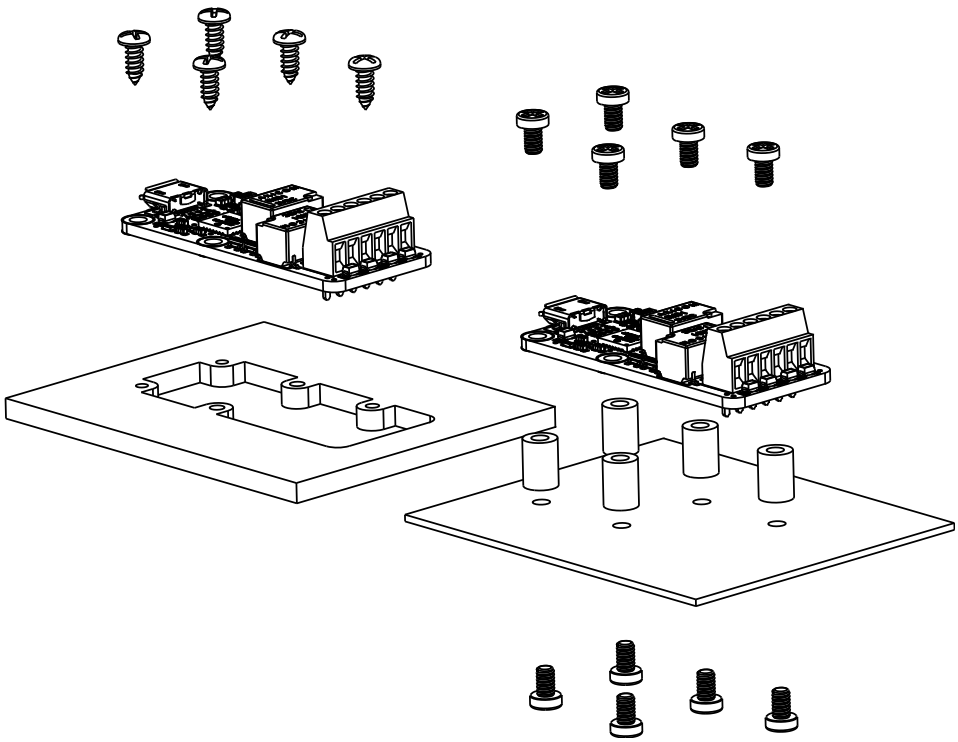
The only functions of the Yocto-Relay module correspond to the embedded relays and have the hardware names "relay1" and "relay2".

5. Assembly and connections

This chapter provides important information regarding the use of the Yocto-Relay module in real-world situations. Make sure to read it carefully before going too far into your project if you want to avoid pitfalls.

5.1. Fixing

While developing your project, you can simply let the module hang at the end of its cable. Check only that it does not come in contact with any conducting material (such as your tools). When your project is almost at an end, you need to find a way for your modules to stop moving around.



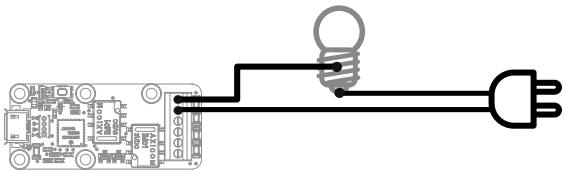
Examples of assembly on supports

The Yocto-Relay module contains 2.5mm assembly holes. You can use these holes for screws. The screw head diameter must not be larger than 4.5mm or they will damage the module circuits. Make sure that the lower surface of the module is not in contact with the support. We recommend using

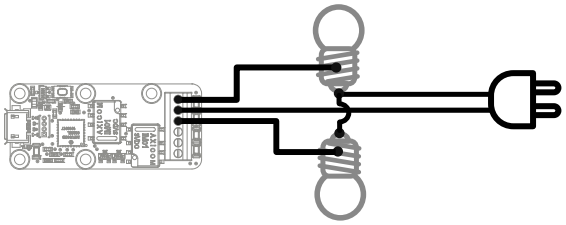
spacers, but other methods are possible. Nothing prevents you from fixing the module with a glue gun; it will not be good-looking, but it will hold.

5.2. Assembly examples

If you obtained this Yocto-Relay module, it is probably because you know exactly what you intend to do with it. You can nevertheless find below a few wiring examples, among the simplest.



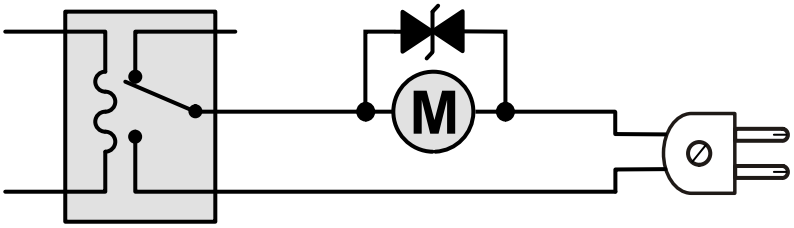
Pilot a light bulb with your Yocto-Relay module.



Pilot two light bulbs in alternation with your Yocto-Relay module.

5.3. Electro-magnetic relays and coils

Some devices that you may wish to control with your Yocto-Relay module contain large coils. It is in particular the case for electric motors and transformers. This may cause trouble because of the auto-induction generated when current goes through a coil. A very high voltage briefly appears at the ends of a coil when when one brutally cuts the current passing through it. This high voltage can create an electric arc where the circuit was cut, in our case inside the relay soldered on the module. This electric arc can eat away the relay connections, leading to premature aging.
Therefore, we advise against controlling electric motors or transformers with an electro-magnetic relay, be it a Yocto-Relay module, or any other command system based on this technology.
It is possible to limit this phenomenon by inserting a TVS diode in parallel with the device containing the coil. These diodes are blocking below a specified voltage, and conductive beyond. So if you clamp one of theses diode on your inductive load, this will short cut voltage peaks. You only have to choose a diode with the right clamping voltage for your application. If you wish to know more, Tyco published an application note about this [1].



Controlling an electric motor with a relay, using a protecting diode.

5.4. USB power distribution

Although USB means *Universal Serial BUS*, USB devices are not physically organized as a flat bus but as a tree, using point-to-point connections. This has consequences on power distribution: to make it simple, every USB port must supply power to all devices directly or indirectly connected to it. And USB puts some limits.

[1] Relay contact life, Application note, Tyco electronics, http://relays.te.com/appnotes/app_pdfs/13c3236.pdf

In theory, a USB port provides 100mA, and may provide up to 500mA if available and requested by the device. In the case of a hub without external power supply, 100mA are available for the hub itself, and the hub should distribute no more than 100mA to each of its ports. This is it, and this is not much. In particular, it means that in theory, it is not possible to connect USB devices through two cascaded hubs without external power supply. In order to cascade hubs, it is necessary to use self-powered USB hubs, that provide a full 500mA to each subport.

In practice, USB would not have been as successful if it was really so picky about power distribution. As it happens, most USB hub manufacturers have been doing savings by not implementing current limitation on ports: they simply connect the computer power supply to every port, and declare themselves as *self-powered hub* even when they are taking all their power from the USB bus (in order to prevent any power consumption check in the operating system). This looks a bit dirty, but given the fact that computer USB ports are usually well protected by a hardware current limitation around 2000mA, it actually works in every day life, and seldom makes hardware damage.

What you should remember: if you connect Yoctopuce modules through one, or more, USB hub without external power supply, you have no safe-guard and you depend entirely on your computer manufacturer attention to provide as much current as possible on the USB ports, and to detect overloads before they lead to problems or to hardware damages. When modules are not provided enough current, they may work erratically and create unpredictable bugs. If you want to prevent any risk, do not cascade hubs without external power supply, and do not connect peripherals requiring more than 100mA behind a bus-powered hub.

In order to help controlling and planning overall power consumption for your project, all Yoctopuce modules include a built-in current sensor that tells (with 5mA precision) the consumption of the module on the USB bus.

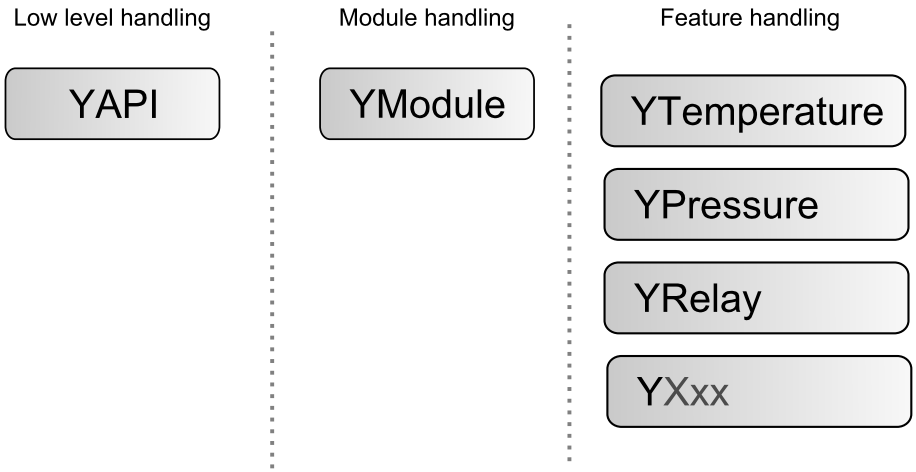
6. Programming, general concepts

The Yoctopuce API was designed to be at the same time simple to use and sufficiently generic for the concepts used to be valid for all the modules in the Yoctopuce range, and this in all the available programming languages. Therefore, when you have understood how to drive your Yocto-Relay with your favorite programming language, learning to use another module, even with a different language, will most likely take you only a minimum of time.

6.1. Programming paradigm

The Yoctopuce API is object oriented. However, for simplicity's sake, only the basics of object programming were used. Even if you are not familiar with object programming, it is unlikely that this will be a hinderance for using Yoctopuce products. Note that you will never need to allocate or deallocate an object linked to the Yoctopuce API: it is automatically managed.

There is one class per Yoctopuce function type. The name of these classes always starts with a Y followed by the name of the function, for example *YTemperature*, *YRelay*, *YPressure*, etc.. There is also a *YModule* class, dedicated to managing the modules themselves, and finally there is the static YAPI class, that supervises the global workings of the API and manages low level communications.



Structure of the Yoctopuce API.

In the Yoctopuce API, priority was put on the ease of access to the module functions by offering the possibility to make abstractions of the modules implementing them. Therefore, it is quite possible to work with a set of functions without ever knowing exactly which module are hosting them at the hardware level. This tremendously simplifies programming projects with a large number of modules.

From the programming stand point, your Yocto-Relay is viewed as a module hosting a given number of functions. In the API, these functions are objects which can be found independently, in several ways.

Access to the functions of a module

Access by logical name
Each function can be assigned an arbitrary and persistent logical name: this logical name is stored in the flash memory of the module, even if this module is disconnected. An object corresponding to an *Xxx* function to which a logical name has been assigned can then be directly found with this logical name and the *YXxx.FindXxx* method. Note however that a logical name must be unique among all the connected modules.

Access by enumeration
You can enumerate all the functions of the same type on all the connected modules with the help of the classic enumeration functions *FirstXxx* and *nextXxxx* available for each *YXxx* class.

Access by hardware name
Each module function has a hardware name, assigned at the factory and which cannot be modified. The functions of a module can also be found directly with this hardware name and the *YXxx.FindXxx* function of the corresponding class.

Difference between *Find* and *First*
The *YXxx.FindXxxx* and *YXxx.FirstXxxx* methods do not work exactly the same way. If there is no available module, *YXxx.FirstXxxx* returns a null value. On the opposite, even if there is no corresponding module, *YXxx.FindXxxx* returns a valid object, which is not online but which could become so if the corresponding module is later connected.

Function handling

When the object corresponding to a function is found, its methods are available in a classic way. Note that most of these subfunctions require the module hosting the function to be connected in order to be handled. This is generally not guaranteed, as a USB module can be disconnected after the control software has started. The *isOnline* method, available in all the classes, is then very helpful.

Access to the modules

Even if it is perfectly possible to build a complete project while making a total abstraction of which function is hosted on which module, the modules themselves are also accessible from the API. In fact, they can be handled in a way quite similar to the functions. They are assigned a serial number at the factory which allows you to find the corresponding object with *YModule.Find()*. You can also assign arbitrary logical names to the modules to make finding them easier. Finally, the *YModule* class contains the *YModule.FirstModule()* and *nextModule()* enumeration methods allowing you to list the connected modules.

Functions/Module interaction

From the API standpoint, the modules and their functions are strongly uncorrelated by design. Nevertheless, the API provides the possibility to go from one to the other. Thus, the *get_module()* method, available for each function class, allows you to find the object corresponding to the module hosting this function. Inversely, the *YModule* class provides several methods allowing you to enumerate the functions available on a module.

6.2. The Yocto-Relay module

The Yocto-Relay module provides two instances of Relay function, corresponding to the two relays of the module.

module : Module

attribute	type	modifiable ?
productName	String	read-only
serialNumber	String	read-only
logicalName	String	modifiable
productId	Hexadecimal number	read-only
productRelease	Hexadecimal number	read-only
firmwareRelease	String	read-only
persistentSettings	Enumerated	modifiable
luminosity	0..100%	modifiable
beacon	On/Off	modifiable
upTime	Time	read-only
usbCurrent	Used current (mA)	read-only
rebootCountdown	Integer	modifiable
usbBandwidth	Enumerated	modifiable

relay1 : Relay
relay2 : Relay

attribute	type	modifiable ?
logicalName	String	modifiable
advertisedValue	String	read-only
state	A/B	modifiable
stateAtPowerOn	Enumerated	modifiable
maxTimeOnStateA	Time	modifiable
maxTimeOnStateB	Time	modifiable
output	On/Off	modifiable
pulseTimer	Time	modifiable
delayedPulseTimer	Aggregate	modifiable
countdown	Time	read-only

6.3. Module control interface

This interface is identical for all Yoctopuce USB modules. It can be used to control the module global parameters, and to enumerate the functions provided by each module.

productName

Character string containing the commercial name of the module, as set by the factory.

serialNumber

Character string containing the serial number, unique and programmed at the factory. For a Yocto-Relay module, this serial number always starts with RELAYLO1. You can use the serial number to access a given module by software.

logicalName

Character string containing the logical name of the module, initially empty. This attribute can be modified at will by the user. Once initialized to an non-empty value, it can be used to access a given module. If two modules with the same logical name are in the same project, there is no way to determine which one answers when one tries accessing by logical name. The logical name is limited to 19 characters among A..Z,a..z,0..9,_, and -.

productId

USB device identifier of the module, preprogrammed to 12 at the factory.

productRelease

Release number of the module hardware, preprogrammed at the factory.

firmwareRelease

Release version of the embedded firmware, changes each time the embedded software is updated.

persistentSettings

State of persistent module settings: loaded from flash memory, modified by the user or saved to flash memory.

luminosity

Lighting strength of the informative leds (e.g. the Yocto-Led) contained in the module. It is an integer value which varies between 0 (leds turned off) and 100 (maximum led intensity). The default value is 50. To change the strength of the module leds, or to turn them off completely, you only need to change this value.

beacon

Activity of the localization beacon of the module.

upTime

Time elapsed since the last time the module was powered on.

usbCurrent

Current consumed by the module on the USB bus, in milli-amps.

rebootCountdown

Countdown to use for triggering a reboot of the module.

usbBandwidth

Number of USB interfaces used by the device. If this parameter is set to **DOUBLE**, the device can send twice as much data, but this may saturate the USB hub. Remember to call the `saveToFlash()` method and then to reboot the module to apply this setting.

6.4. Relay function interface

The Yoctopuce application programming interface allows you to switch the relay state. This change is not persistent: the relay will automatically return to its idle position whenever power is lost or if the module is restarted. The library can also generate automatically short pulses of determined duration. On devices with two output for each relay (double throw), the two outputs are named A and B, with output A corresponding to the idle position (at power off) and the output B corresponding to the active state. If you prefer the alternate default state, simply switch your cables on the board.

logicalName

Character string containing the logical name of the relay, initially empty. This attribute can be modified at will by the user. Once initialized to an non-empty value, it can be used to access the relay directly. If two relays with the same logical name are used in the same project, there is no way to determine which one answers when one tries accessing by logical name. The logical name is limited to 19 characters among `A..Z`,`a..z`,`0..9`,`_`, and `-`.

advertisedValue

Short character string summarizing the current state of the relay, that will be automatically advertised up to the parent hub. For a relay, the advertised value is the the relays state (A for the idle position, B for the active position).

state

Active output of the relays: A for the idle position, B for the active position.

stateAtPowerOn

Active output of the relays at device power up: A for the idle position, B for the active position, UNCHANGED to leave the relay as is.

maxTimeOnStateA

Maximum time (ms) allowed for relays to stay in state A before automatically switching back in to B state. Zéro means no maximum time.

maxTimeOnStateB

Maximum time (ms) allowed for relays to stay in state B before automatically switching back in to A state. Zéro means no maximum time.

output

Output state of the relays, when used as a simple switch (single throw).

pulseTimer

Time during which the relays should be kept in state B (active) before returning automatically to state A (idle state). Any explicit state change issued afterwards will cancel the automated switch.

delayedPulseTimer

Delayed pulse parameters.

countdown

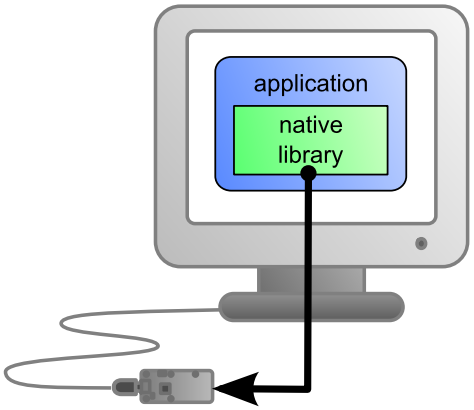
Waiting delay before next pulse (delayed pulse case).

6.5. What interface: Native, DLL or Service ?

There are several methods to control you Yoctopuce module by software.

Native control

In this case, the software driving your project is compiled directly with a library which provides control of the modules. Objectively, it is the simplest and most elegant solution for the end user. The end user then only needs to plug the USB cable and run your software for everything to work. Unfortunately, this method is not always available or even possible.

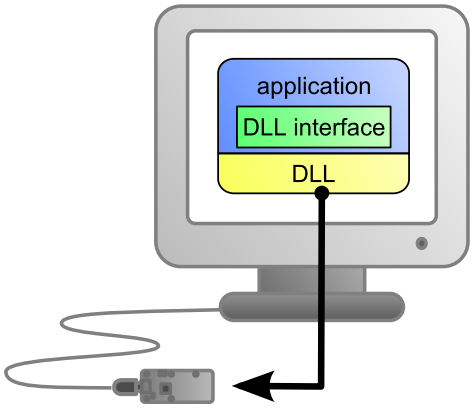


The application uses the native library to control the locally connected module

Native control by DLL

Here, the main part of the code controlling the modules is located in a DLL. The software is compiled with a small library which provides control of the DLL. It is the fastest method to code module support in a given language. Indeed, the "useful" part of the control code is located in the DLL which is the

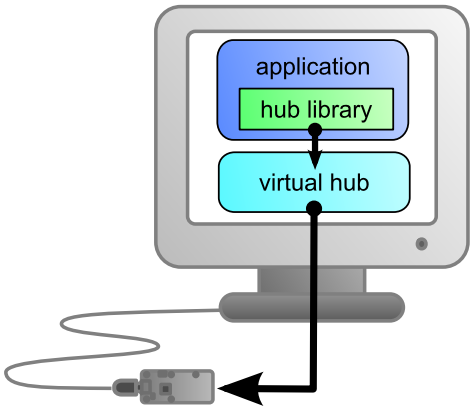
same for all languages: the effort to support a new language is limited to coding the small library which controls the DLL. From the end user stand point, there are few differences: one must simply make sure that the DLL is installed on the end user's computer at the same time as the main software.



The application uses the DLL to natively control the locally connected module

Control by service

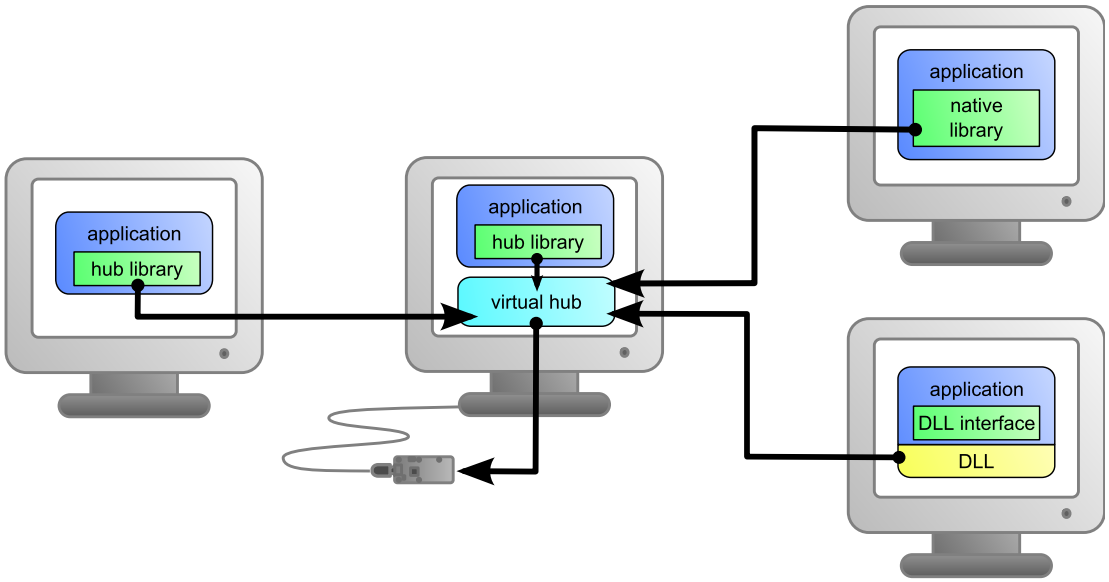
Some languages do simply not allow you to easily gain access to the hardware layers of the machine. It is the case for Javascript, for instance. To deal with this case, Yoctopuce provides a solution in the form of a small piece of software called *Virtual Hub*[1]. It can access the modules, and your application only needs to use a library which offers all necessary functions to control the modules via this virtual hub. The end users will have to start the virtual hub before running the project control software itself, unless they decide to install the hub as a service/deamon, in which case the virtual hub starts automatically when the machine starts up.



The application connects itself to the virtual hub to gain access to the module

The service control method comes with a non-negligible advantage: the application does not need to run on the machine on which the modules are connected. The application can very well be located on another machine which connects itself to the service to drive the modules. Moreover, the native libraries and DLL mentioned above are also able to connect themselves remotely to one or several virtual hubs.

[1] www.yoctopuce.com/EN/virtualhub.php



When a virtual hub is used, the control application does not need to reside on the same machine as the module.

Whatever the selected programming language and the control paradigm used, programming itself stays strictly identical. From one language to another, functions bear exactly the same name, and have the same parameters. The only differences are linked to the constraints of the languages themselves.

Language	Native	Native with DLL	Virtual hub
C++	•	•	•
Objective-C	•	-	•
Delphi	-	•	•
Python	-	•	•
VisualBasic .Net	-	•	•
C# .Net	-	•	•
Javascript	-	-	•
Node.js	-	-	•
PHP	-	-	•
Java	-	-	•
Java for Android	•	-	•
Command line	•	-	•

Support methods for different languages

Limitations of the Yoctopuce libraries

Natives et DLL libraries have a technical limitation. On the same computer, you cannot concurrently run several applications accessing Yoctopuce devices directly. If you want to run several projects on the same computer, make sure your control applications use Yoctopuce devices through a *VirtualHub* software. The modification is trivial: it is just a matter of parameter change in the `yRegisterHub()` call.

6.6. Programming, where to start?

At this point of the user's guide, you should know the main theoretical points of your Yocto-Relay. It is now time to practice. You must download the Yoctopuce library for your favorite programming language from the Yoctopuce web site[2]. Then skip directly to the chapter corresponding to the chosen programming language.

All the examples described in this guide are available in the programming libraries. For some languages, the libraries also include some complete graphical applications, with their source code.

When you have mastered the basic programming of your module, you can turn to the chapter on advanced programming that describes some techniques that will help you make the most of your Yocto-Relay.

[2] http://www.yoctopuce.com/EN/libraries.php

7. Using the Yocto-Relay in command line

When you want to perform a punctual operation on your Yocto-Relay, such as reading a value, assigning a logical name, and so on, you can obviously use the Virtual Hub, but there is a simpler, faster, and more efficient method: the command line API.

The command line API is a set of executables, one by type of functionality offered by the range of Yoctopuce products. These executables are provided pre-compiled for all the Yoctopuce officially supported platforms/OS. Naturally, the executable sources are also provided[1].

7.1. Installing

Download the command line API[2]. You do not need to run any setup, simply copy the executables corresponding to your platform/OS in a directory of your choice. You may add this directory to your PATH variable to be able to access these executables from anywhere. You are all set, you only need to connect your Yocto-Relay, open a shell, and start working by typing for example:

```
C:\>YRelay any set_state B
```

To use the command API on Linux, you need either have root privileges or to define an *udev* rule for your system. See the *Troubleshooting* chapter for more details.

7.2. Use: general description

All the command line API executables work on the same principle. They must be called the following way

```
C:\>Executable [options] [target] command [parameter]
```

`[options]` manage the global workings of the commands, they allow you, for instance, to pilot a module remotely through the network, or to force the module to save its configuration after executing the command.

`[target]` is the name of the module or of the function to which the command applies. Some very generic commands do not need a target. You can also use the aliases "*any*" and "*all*", or a list of names separated by comas without space.

[1] If you want to recompile the command line API, you also need the C++ API.
[2] http://www.yoctopuce.com/EN/libraries.php

`command` is the command you want to run. Almost all the functions available in the classic programming APIs are available as commands. You need to respect neither the case nor the underlined characters in the command name.

`[parameters]` logically are the parameters needed by the command.

At any time, the command line API executables can provide a rather detailed help. Use for instance:

```
C:\>executable /help
```

to know the list of available commands for a given command line API executable, or even:

```
C:\>executable command /help
```

to obtain a detailed description of the parameters of a command.

7.3. Control of the Relay function

To control the Relay function of your Yocto-Relay, you need the YRelay executable file.

For instance, you can launch:

```
C:\>YRelay any set_state B
```

This example uses the "*any*" target to indicate that we want to work on the first Relay function found among all those available on the connected Yoctopuce modules when running. This prevents you from having to know the exact names of your function and of your module.

But you can use logical names as well, as long as you have configured them beforehand. Let us imagine a Yocto-Relay module with the *RELAYLO1-123456* serial number which you have called "*MyModule*", and its relay1 function which you have renamed "*MyFunction*". The five following calls are strictly equivalent (as long as *MyFunction* is defined only once, to avoid any ambiguity).

```
C:\>YRelay RELAYLO1-123456.relay1 describe

C:\>YRelay RELAYLO1-123456.MyFunction describe

C:\>YRelay MyModule.relay1 describe

C:\>YRelay MyModule.MyFunction describe

C:\>YRelay MyFunction describe
```

To work on all the Relay functions at the same time, use the "*all*" target.

```
C:\>YRelay all describe
```

For more details on the possibilities of the `YRelay` executable, use:

```
C:\>YRelay /help
```

7.4. Control of the module part

Each module can be controlled in a similar way with the help of the `YModule` executable. For example, to obtain the list of all the connected modules, use:

```
C:\>YModule inventory
```

You can also use the following command to obtain an even more detailed list of the connected modules:

```
C:\>YModule all describe
```

Each xxx property of the module can be obtained thanks to a command of the get_xxxx() type, and the properties which are not read only can be modified with the set_xxx() command. For example:

```
C:\>YModule RELAYLO1-12346 set_logicalName MonPremierModule

C:\>YModule RELAYLO1-12346 get_logicalName
```

Changing the settings of the module

When you want to change the settings of a module, simply use the corresponding set_xxx command. However, this change happens only in the module RAM: if the module restarts, the changes are lost. To store them permanently, you must tell the module to save its current configuration in its nonvolatile memory. To do so, use the saveToFlash command. Inversely, it is possible to force the module to forget its current settings by using the revertFromFlash method. For example:

```
C:\>YModule RELAYLO1-12346 set_logicalName MonPremierModule
C:\>YModule RELAYLO1-12346 saveToFlash
```

Note that you can do the same thing in a single command with the -s option.

```
C:\>YModule -s  RELAYLO1-12346 set_logicalName MonPremierModule
```

Warning: the number of write cycles of the nonvolatile memory of the module is limited. When this limit is reached, nothing guaranties that the saving process is performed correctly. This limit, linked to the technology employed by the module micro-processor, is located at about 100000 cycles. In short, you can use the saveToFlash() function only 100000 times in the life of the module. Make sure you do not call this function within a loop.

7.5. Limitations

The command line API has the same limitation than the other APIs: there can be only one application at a given time which can access the modules natively. By default, the command line API works in native mode.

You can easily work around this limitation by using a Virtual Hub: run the VirtualHub[3] on the concerned machine, and use the executables of the command line API with the -r option. For example, if you use:

```
C:\>YModule  inventory
```

you obtain a list of the modules connected by USB, using a native access. If another command which accesses the modules natively is already running, this does not work. But if you run a Virtual Hub, and you give your command in the form:

```
C:\>YModule -r 127.0.0.1 inventory
```

it works because the command is not executed natively anymore, but through the Virtual Hub. Note that the Virtual Hub counts as a native application.

[3] http://www.yoctopuce.com/EN/virtualhub.php

8. Using Yocto-Relay with Javascript

Javascript is probably not the first language that comes to mind to control hardware, but its ease of use is a great advantage: with Javascript, you only need a text editor and a web browser to realize your first tests.

At the time of writing, the Javascript library functions with any recent browser ... except Opera. It is likely that Opera will end up working with the Yoctopuce library one of these days[1], but it is not the case right now.

Javascript is one of those languages which do not allow you to directly access the hardware layers of your computer. Therefore you need to run the Yoctopuce TCP/IP to USB gateway, named *VirtualHub*, on the machine on which your modules are connected.

8.1. Getting ready

Go to the Yoctopuce web site and download the following items:

- The Javascript programming library[2]
- The VirtualHub software[3] for Windows, Mac OS X or Linux, depending on your OS

Decompress the library files in a folder of your choice, connect your modules, run the VirtualHub software, and you are ready to start your first tests. You do not need to install any driver.

8.2. Control of the Relay function

A few lines of code are enough to use a Yocto-Relay. Here is the skeleton of a JavaScript code snipplet to use the Relay function.

```
<SCRIPT type="text/javascript" src="yocto_api.js"></SCRIPT>
<SCRIPT type="text/javascript" src="yocto_relay.js"></SCRIPT>

// Get access to your device, through the VirtualHub running locally
yRegisterHub('http://127.0.0.1:4444/');
var relay = yFindRelay("RELAYLO1-123456.relay1");

// Check that the module is online to handle hot-plug
if(relay.isOnline())
```

[1] Actually, as soon as Opera implements support for the HTTP Access-Control-Allow-Origin header.
[2] www.yoctopuce.com/EN/libraries.php
[3] www.yoctopuce.com/EN/virtualhub.php

```
{
    // Use relay.set_state(), ...
}
```

Let us look at these lines in more details.

yocto_api.js and yocto_relay.js

These two Javascript includes provide access to functions allowing you to manage Yoctopuce modules. `yocto_api.js` must always be included, `yocto_relay.js` is necessary to manage modules containing a relay, such as Yocto-Relay.

yRegisterHub

The `yRegisterHub` function allows you to indicate on which machine the Yoctopuce modules are located, more precisely on which machine the VirtualHub software is running. In our case, the `127.0.0.1:4444` address indicates the local machine, port `4444` (the standard port used by Yoctopuce). You can very well modify this address, and enter the address of another machine on which the VirtualHub software is running.

yFindRelay

The `yFindRelay` function allows you to find a relay from the serial number of the module on which it resides and from its function name. You can also use logical names, as long as you have initialized them. Let us imagine a Yocto-Relay module with serial number *RELAYLO1-123456* which you have named "*MyModule*", and for which you have given the *relay1* function the name "*MyFunction*". The following five calls are strictly equivalent, as long as "*MyFunction*" is defined only once.

```
var relay = yFindRelay("RELAYLO1-123456.relay1");
var relay = yFindRelay("RELAYLO1-123456.MyFunction");
var relay = yFindRelay("MyModule.relay1");
var relay = yFindRelay("MyModule.MyFunction");
var relay = yFindRelay("MyFunction");
```

`yFindRelay` returns an object which you can then use at will to control the relay.

isOnline

The `isOnline()` method of the object returned by `yFindRelay` allows you to know if the corresponding module is present and in working order.

set_state

The `set_state()` method of the objet returned by `yFindRelay` switches the relay position to one of its two outputs. The two possible parameter values are `Y_STATE_A` for output A, and `Y_STATE_B` for output B.

A real example

Open your preferred text editor[4], copy the code sample below, save it in the same directory as the Yoctopuce library files and then use your preferred web browser to access this page. The code is also provided in the directory **Examples/Doc-GettingStarted-Yocto-Relay** of the Yoctopuce library.

In this example, you will recognize the functions explained above, but this time used with all side materials needed to make it work nicely as a small demo.

The example is coded to be used either from a web server, or directly by opening the file on the local machine. Note that this latest solution does not work with some versions of Internet Explorer, in particular IE 9 on Windows 7, which is not able to open network connections when working on a local file. In order to use Internet Explorer, you should load the example from a web server. No such problem exists with Chrome, Firefox or Safari.

[4] If you do not have a text editor, use Notepad rather than Microsoft Word.

If your Yocto-Relay is not connected on the host running the browser, replace in the example the address `127.0.0.1` by the IP address of the host on which the Yocto-Relay is connected and where you run the VirtualHub.

```
<HTML>
<HEAD>
 <TITLE>Hello World</TITLE>
 <SCRIPT type="text/javascript" src="yocto_api.js"></SCRIPT>
 <SCRIPT type="text/javascript" src="yocto_relay.js"></SCRIPT>
 <SCRIPT language='javascript1.5' type='text/JavaScript'>
 <!--

 // Setup the API to use the VirtualHub on local machine
 if(yRegisterHub('http://127.0.0.1:4444/') != YAPI_SUCCESS) {
     alert("Cannot contact VirtualHub on 127.0.0.1");
 }

 var r1, r2;

 function refresh()
 {
     var serial = document.getElementById('serial').value;
     if(serial == '') {
         // Detect any conected module suitable for the demo
         r1 = yFirstRelay();
         if(r1) {
             serial = r1.module().get_serialNumber();
             document.getElementById('serial').value = serial;
         }
     }

     r1 = yFindRelay(serial+".relay1");
     r2 = yFindRelay(serial+".relay2");
     if(r1.isOnline()) {
         document.getElementById('msg').value = '';
     } else {
         document.getElementById('msg').value = 'Module not connected';
     }
     setTimeout('refresh()',500);
 }

 function switchIt(relay,state)
 {
     if (state) relay.set_state(Y_STATE_B);
           else relay.set_state(Y_STATE_A);
 }
 -->
 </SCRIPT>
</HEAD>
<BODY onload='refresh();'>
 Module to use: <input id='serial'>
 <input id='msg' style='color:red;border:none;' readonly><br>
 <a href='javascript:switchIt(r1,true);' >Switch relay 1 to outpout B</a><br>
 <a href='javascript:switchIt(r1,false);'>Switch relay 1 to output A</a><br>
 <a href='javascript:switchIt(r2,true);' >Switch relay 2 to output B</a><br>
 <a href='javascript:switchIt(r2,false);'>Switch relay 2 to output A</a><br>
</BODY>
</HTML>
```

8.3. Control of the module part

Each module can be controlled in a similar manner, you can find below a simple sample program displaying the main parameters of the module and enabling you to activate the localization beacon.

```
<HTML>
<HEAD>
 <TITLE>Module Control</TITLE>
 <SCRIPT type="text/javascript" src="yocto_api.js"></SCRIPT>
 <SCRIPT language='javascript1.5'  type='text/JavaScript'>
 <!--
 // Use explicit error handling rather than exceptions
 yDisableExceptions();
```

```
// Setup the API to use the VirtualHub on local machine
if(yRegisterHub('http://127.0.0.1:4444/') != YAPI_SUCCESS) {
    alert("Cannot contact VirtualHub on 127.0.0.1");
}

var module;

function refresh()
{
    var serial = document.getElementById('serial').value;
    if(serial == '') {
        // Detect any conected module suitable for the demo
        module = yFirstModule().nextModule();
        if(module) {
            serial = module.get_serialNumber();
            document.getElementById('serial').value = serial;
        }
    }

    module = yFindModule(serial);
    if(module.isOnline()) {
        document.getElementById('msg').value = '';
        var html = 'serial: '+module.get_serialNumber()+'<br>';
        html += 'logical name: '+module.get_logicalName()+'<br>';
        html += 'luminosity:'+module.get_luminosity()+'%<br>';
        html += 'beacon:';
        if (module.get_beacon()==Y_BEACON_ON)
            html+="ON <a href='javascript:beacon(Y_BEACON_OFF)'>switch off</a><br>";
        else
            html+="OFF <a href='javascript:beacon(Y_BEACON_ON)'>switch on</a><br>";

        html += 'upTime: '+parseInt(module.get_upTime()/1000)+' sec<br>';
        html += 'USB current: '+module.get_usbCurrent()+' mA<br>';
        html += 'logs:<br><pre>'+module.get_lastLogs()+'</pre><br>';
        document.getElementById('data').innerHTML = html;
    } else {
        document.getElementById('msg').value = 'Module not connected';
    }
    setTimeout('refresh()',1000);
}

function beacon(state)
{
    module.set_beacon(state);
    refresh();
}
-->
</SCRIPT>
</HEAD>
<BODY onload='refresh();'>
 Module to use: <input id='serial'>
 <input id='msg' style='color:red;border:none;' readonly><br>
 <span id='data'></span>
</BODY>
</HTML>
```

Each property `xxx` of the module can be read thanks to a method of type `get_xxxx()`, and properties which are not read-only can be modified with the help of the `set_xxx()` method. For more details regarding the used functions, refer to the API chapters.

Changing the module settings

When you want to modify the settings of a module, you only need to call the corresponding `set_xxx()` function. However, this modification is performed only in the random access memory (RAM) of the module: if the module is restarted, the modifications are lost. To memorize them persistently, it is necessary to ask the module to save its current configuration in its permanent memory. To do so, use the `saveToFlash()` method. Inversely, it is possible to force the module to forget its current settings by using the `revertFromFlash()` method. The short example below allows you to modify the logical name of a module.

```
<HTML>
<HEAD>
 <TITLE>Change module settings</TITLE>
```

```
<SCRIPT type="text/javascript" src="yocto_api.js"></SCRIPT>
<SCRIPT language='javascript1.5'  type='text/JavaScript'>
<!--
// Use explicit error handling rather than exceptions
yDisableExceptions();

// Setup the API to use the VirtualHub on local machine
if(yRegisterHub('http://127.0.0.1:4444/') != YAPI_SUCCESS) {
    alert("Cannot contact VirtualHub on 127.0.0.1");
}

var module;

function refresh()
{
    var serial = document.getElementById('serial').value;
    if(serial == '') {
        // Detect any conected module suitable for the demo
        module = yFirstModule().nextModule();
        if(module) {
            serial = module.get_serialNumber();
            document.getElementById('serial').value = serial;
        }
    }

    module = yFindModule(serial);
    if(module.isOnline()) {
        document.getElementById('msg').value = '';
        document.getElementById('curName').value = module.get_logicalName();
    } else {
        document.getElementById('msg').value = 'Module not connected';
    }
    setTimeout('refresh()',1000);
}

function save()
{
    var newname = document.getElementById('newName').value;
    if (!yCheckLogicalName(newname)) {
        alert('invalid logical name');
        return;
    }
    module.set_logicalName(newname);
    module.saveToFlash();
}
-->
</SCRIPT>
</HEAD>
<BODY onload='refresh();'>
Module to use: <input id='serial'>
<input id='msg' style='color:red;border:none;' readonly><br>
Current name: <input id='curName' readonly><br>
New logical name: <input id='newName'>
<a href='javascript:save();'>Save</a>
</BODY>
</HTML>
```

Warning: the number of write cycles of the nonvolatile memory of the module is limited. When this limit is reached, nothing guaranties that the saving process is performed correctly. This limit, linked to the technology employed by the module micro-processor, is located at about 100000 cycles. In short, you can use the `saveToFlash()` function only 100000 times in the life of the module. Make sure you do not call this function within a loop.

Listing the modules

Obtaining the list of the connected modules is performed with the `yFirstModule()` function which returns the first module found. Then, you only need to call the `nextModule()` function of this object to find the following modules, and this as long as the returned value is not `NULL`. Below a short example listing the connected modules.

```
<HTML>
<HEAD>
 <TITLE>Modules inventory</TITLE>
 <SCRIPT type="text/javascript" src="yocto_api.js"></SCRIPT>
```

```
<SCRIPT language='javascript1.5'  type='text/JavaScript'>
<!--
// Use explicit error handling rather than exceptions
yDisableExceptions();

// Setup the API to use the VirtualHub on local machine
if(yRegisterHub('http://127.0.0.1:4444/') != YAPI_SUCCESS) {
    alert("Cannot contact VirtualHub on 127.0.0.1");
}

function refresh()
{
    yUpdateDeviceList();

    var htmlcode = '';
    var module = yFirstModule();
    while(module) {
        htmlcode += module.get_serialNumber()
                    +'('+module.get_productName()+")<br>";
        module = module.nextModule();
    }
    document.getElementById('list').innerHTML=htmlcode;
    setTimeout('refresh()',500);
}
-->
</SCRIPT>
</HEAD>
<BODY onload='refresh();'>
 <H1>Device list</H1>
 <tt><span id='list'></span></tt>
</BODY>
</HTML>
```

8.4. Error handling

When you implement a program which must interact with USB modules, you cannot disregard error handling. Inevitably, there will be a time when a user will have unplugged the device, either before running the software, or even while the software is running. The Yoctopuce library is designed to help you support this kind of behavior, but your code must nevertheless be conceived to interpret in the best possible way the errors indicated by the library.

The simplest way to work around the problem is the one used in the short examples provided in this chapter: before accessing a module, check that it is online with the `isOnline` function, and then hope that it will stay so during the fraction of a second necessary for the following code lines to run. This method is not perfect, but it can be sufficient in some cases. You must however be aware that you cannot completely exclude an error which would occur after the call to `isOnline` and which could crash the software. The only way to prevent this is to implement one of the two error handling techniques described below.

The method recommended by most programming languages for unpredictable error handling is the use of exceptions. By default, it is the behavior of the Yoctopuce library. If an error happens while you try to access a module, the library throws an exception. In this case, there are three possibilities:

- If your code catches the exception and handles it, everything goes well.
- If your program is running in debug mode, you can relatively easily determine where the problem happened and view the explanatory message linked to the exception.
- Otherwise... the exception makes your program crash, bang!

As this latest situation is not the most desirable, the Yoctopuce library offers another possibility for error handling, allowing you to create a robust program without needing to catch exceptions at every line of code. You simply need to call the `yDisableExceptions()` function to commute the library to a mode where exceptions for all the functions are systematically replaced by specific return values, which can be tested by the caller when necessary. For each function, the name of each return value in case of error is systematically documented in the library reference. The name always follows the same logic: a `get_state()` method returns a `Y_STATE_INVALID` value, a `get_currentValue` method returns a `Y_CURRENTVALUE_INVALID` value, and so on. In any

case, the returned value is of the expected type and is not a null pointer which would risk crashing your program. At worst, if you display the value without testing it, it will be outside the expected bounds for the returned value. In the case of functions which do not normally return information, the return value is `YAPI_SUCCESS` if everything went well, and a different error code in case of failure.

When you work without exceptions, you can obtain an error code and an error message explaining the source of the error. You can request them from the object which returned the error, calling the `errType()` and `errMessage()` methods. Their returned values contain the same information as in the exceptions when they are active.

9. Using Yocto-Relay with PHP

PHP is, like Javascript, an atypical language when interfacing with hardware is at stakes. Nevertheless, using PHP with Yoctopuce modules provides you with the opportunity to very easily create web sites which are able to interact with their physical environment, and this is not available to every web server. This technique has a direct application in home automation: a few Yoctopuce modules, a PHP server, and you can interact with your home from anywhere on the planet, as long as you have an internet connection.

PHP is one of those languages which do not allow you to directly access the hardware layers of your computer. Therefore you need to run a virtual hub on the machine on which your modules are connected.

To start your tests with PHP, you need a PHP 5.3 (or more) server[1], preferably locally on you machine. If you wish to use the PHP server of your internet provider, it is possible, but you will probably need to configure your ADSL router for it to accept and forward TCP request on the 4444 port.

9.1. Getting ready

Go to the Yoctopuce web site and download the following items:

- The PHP programming library[2]
- The VirtualHub software[3] for Windows, Mac OS X, or Linux, depending on your OS

Decompress the library files in a folder of your choice accessible to your web server, connect your modules, run the VirtualHub software, and you are ready to start your first tests. You do not need to install any driver.

9.2. Control of the Relay function

A few lines of code are enough to use a Yocto-Relay. Here is the skeleton of a PHP code snipplet to use the Relay function.

```
include('yocto_api.php');
include('yocto_relay.php');
```

[1] A couple of free PHP servers: easyPHP for Windows, MAMP for Mac OS X.
[2] www.yoctopuce.com/EN/libraries.php
[3] www.yoctopuce.com/EN/virtualhub.php

```
// Get access to your device, through the VirtualHub running locally
yRegisterHub('http://127.0.0.1:4444/',$errmsg);
$relay = yFindRelay("RELAYLO1-123456.relay1");

// Check that the module is online to handle hot-plug
if(relay->isOnline())
{
    // Use relay->set_state(), ...
}
```

Let's look at these lines in more details.

yocto_api.php and yocto_relay.php

These two PHP includes provides access to the functions allowing you to manage Yoctopuce modules. `yocto_api.php` must always be included, `yocto_relay.php` is necessary to manage modules containing a relay, such as Yocto-Relay.

yRegisterHub

The `yRegisterHub` function allows you to indicate on which machine the Yoctopuce modules are located, more precisely on which machine the VirtualHub software is running. In our case, the `127.0.0.1:4444` address indicates the local machine, port `4444` (the standard port used by Yoctopuce). You can very well modify this address, and enter the address of another machine on which the VirtualHub software is running.

yFindRelay

The `yFindRelay` function allows you to find a relay from the serial number of the module on which it resides and from its function name. You can use logical names as well, as long as you have initialized them. Let us imagine a Yocto-Relay module with serial number *RELAYLO1-123456* which you have named "*MyModule*", and for which you have given the *relay1* function the name "*MyFunction*". The following five calls are strictly equivalent, as long as "*MyFunction*" is defined only once.

```
$relay = yFindRelay("RELAYLO1-123456.relay1");
$relay = yFindRelay("RELAYLO1-123456.MyFunction");
$relay = yFindRelay("MyModule.relay1");
$relay = yFindRelay("MyModule.MyFunction");
$relay = yFindRelay("MyFunction");
```

`yFindRelay` returns an object which you can then use at will to control the relay.

isOnline

The `isOnline()` method of the object returned by `yFindRelay` allows you to know if the corresponding module is present and in working order.

set_state

The `set_state()` method of the objet returned by `yFindRelay` switches the relay position to one of its two outputs. The two possible parameter values are `Y_STATE_A` for output A, and `Y_STATE_B` for output B.

A real example

Open your preferred text editor[4], copy the code sample below, save it with the Yoctopuce library files in a location which is accessible to you web server, then use your preferred web browser to access this page. The code is also provided in the directory **Examples/Doc-GettingStarted-Yocto-Relay** of the Yoctopuce library.

In this example, you will recognize the functions explained above, but this time used with all side materials needed to make it work nicely as a small demo.

[4] If you do not have a text editor, use Notepad rather than Microsoft Word.

```
<HTML>
<HEAD>
 <TITLE>Hello World</TITLE>
</HEAD>
<BODY>
<FORM method='get'>
<?php
  include('yocto_api.php');
  include('yocto_relay.php');

  // Use explicit error handling rather than exceptions
  yDisableExceptions();

  // Setup the API to use the VirtualHub on local machine
  if(yRegisterHub('http://127.0.0.1:4444/',$errmsg) != YAPI_SUCCESS) {
      die("Cannot contact VirtualHub on 127.0.0.1");
  }

  @$serial = $_GET['serial'];
  if ($serial != '') {
      // Check if a specified module is available online
      $relay1 = yFindRelay("$serial.relay1");
      $relay2 = yFindRelay("$serial.relay2");
      if (!$relay1->isOnline()) {
          die("Module not connected (check serial and USB cable)");
      }
  } else {
      // or use any connected module suitable for the demo
      // (note that the order of enumeration may vary)
      $relay1 = yFirstRelay();
      if(is_null($relay1)) {
          die("No module connected (check USB cable)");
      } else {
          $relay2 = $relay1->nextRelay();
          $serial = $relay1->module()->get_serialnumber();
      }
  }
  Print("Module to use: <input name='serial' value='$serial'><br>");

  // Drive the selected module
  if (isset($_GET['state1'])) {
      $state = $_GET['state1'];
      if ($state=='A') $relay1->set_state(Y_STATE_A);
      if ($state=='B') $relay1->set_state(Y_STATE_B);
  }
  if (isset($_GET['state2'])) {
      $state = $_GET['state2'];
      if ($state=='A') $relay2->set_state(Y_STATE_A);
      if ($state=='B') $relay2->set_state(Y_STATE_B);
  }
?>
Relay 1: <input type='radio' name='state1' value='A'>Output A
         <input type='radio' name='state1' value='B'>Output B<br>
Relay 2: <input type='radio' name='state2' value='A'>Output A
         <input type='radio' name='state2' value='B'>Output B<br>
<input type='submit'>
</FORM>
</BODY>
</HTML>
```

9.3. Control of the module part

Each module can be controlled in a similar manner, you can find below a simple sample program displaying the main parameters of the module and enabling you to activate the localization beacon.

```
<HTML>
<HEAD>
 <TITLE>Module Control</TITLE>
</HEAD>
<BODY>
<FORM method='get'>
<?php
  include('yocto_api.php');
```

```
  // Use explicit error handling rather than exceptions
  yDisableExceptions();

  // Setup the API to use the VirtualHub on local machine
  if(yRegisterHub('http://127.0.0.1:4444/',$errmsg) != YAPI_SUCCESS) {
      die("Cannot contact VirtualHub on 127.0.0.1 : ".$errmsg);
  }

  @$serial = $_GET['serial'];
  if ($serial != '') {
      // Check if a specified module is available online
      $module = yFindModule("$serial");
      if (!$module->isOnline()) {
          die("Module not connected (check serial and USB cable)");
      }
  } else {
      // or use any connected module suitable for the demo
      $module = yFirstModule();
      if($module) { // skip VirtualHub
          $module = $module->nextModule();
      }
      if(is_null($module)) {
          die("No module connected (check USB cable)");
      } else {
          $serial = $module->get_serialnumber();
      }
  }
  Print("Module to use: <input name='serial' value='$serial'><br>");

  if (isset($_GET['beacon'])) {
      if ($_GET['beacon']=='ON')
          $module->set_beacon(Y_BEACON_ON);
      else
          $module->set_beacon(Y_BEACON_OFF);
  }
  printf('serial: %s<br>',$module->get_serialNumber());
  printf('logical name: %s<br>',$module->get_logicalName());
  printf('luminosity: %s<br>',$module->get_luminosity());
  print('beacon: ');
  if($module->get_beacon() == Y_BEACON_ON) {
      printf("<input type='radio' name='beacon' value='ON' checked>ON ");
      printf("<input type='radio' name='beacon' value='OFF'>OFF<br>");
  } else {
      printf("<input type='radio' name='beacon' value='ON'>ON ");
      printf("<input type='radio' name='beacon' value='OFF' checked>OFF<br>");
  }
  printf('upTime: %s sec<br>',intVal($module->get_upTime()/1000));
  printf('USB current: %smA<br>',$module->get_usbCurrent());
  printf('logs:<br><pre>%s</pre>',$module->get_lastLogs());
?>
<input type='submit' value='refresh'>
</FORM>
</BODY>
</HTML>
```

Each property `xxx` of the module can be read thanks to a method of type `get_xxxx()`, and properties which are not read-only can be modified with the help of the `set_xxx()` method. For more details regarding the used functions, refer to the API chapters.

Changing the module settings

When you want to modify the settings of a module, you only need to call the corresponding `set_xxx()` function. However, this modification is performed only in the random access memory (RAM) of the module: if the module is restarted, the modifications are lost. To memorize them persistently, it is necessary to ask the module to save its current configuration in its permanent memory. To do so, use the `saveToFlash()` method. Inversely, it is possible to force the module to forget its current settings by using the `revertFromFlash()` method. The short example below allows you to modify the logical name of a module.

```
<HTML>
<HEAD>
 <TITLE>save settings</TITLE>
<BODY>
```

```
<FORM method='get'>
<?php
  include('yocto_api.php');

  // Use explicit error handling rather than exceptions
  yDisableExceptions();

  // Setup the API to use the VirtualHub on local machine
  if(yRegisterHub('http://127.0.0.1:4444/',$errmsg) != YAPI_SUCCESS) {
      die("Cannot contact VirtualHub on 127.0.0.1");
  }

  @$serial = $_GET['serial'];
  if ($serial != '') {
      // Check if a specified module is available online
      $module = yFindModule("$serial");
      if (!$module->isOnline()) {
          die("Module not connected (check serial and USB cable)");
      }
  } else {
      // or use any connected module suitable for the demo
      $module = yFirstModule();
      if($module) { // skip VirtualHub
          $module = $module->nextModule();
      }
      if(is_null($module)) {
          die("No module connected (check USB cable)");
      } else {
          $serial = $module->get_serialnumber();
      }
  }
  Print("Module to use: <input name='serial' value='$serial'><br>");

  if (isset($_GET['newname'])){
      $newname = $_GET['newname'];
      if (!yCheckLogicalName($newname))
          die('Invalid name');
      $module->set_logicalName($newname);
      $module->saveToFlash();
  }
  printf("Current name: %s<br>", $module->get_logicalName());
  print("New name: <input name='newname' value='' maxlength=19><br>");
?>
<input type='submit'>
</FORM>
</BODY>
</HTML>
```

Warning: the number of write cycles of the nonvolatile memory of the module is limited. When this limit is reached, nothing guaranties that the saving process is performed correctly. This limit, linked to the technology employed by the module micro-processor, is located at about 100000 cycles. In short, you can use the `saveToFlash()` function only 100000 times in the life of the module. Make sure you do not call this function within a loop.

Listing the modules

Obtaining the list of the connected modules is performed with the `yFirstModule()` function which returns the first module found. Then, you only need to call the `nextModule()` function of this object to find the following modules, and this as long as the returned value is not `NULL`. Below a short example listing the connected modules.

```
<HTML>
<HEAD>
 <TITLE>inventory</TITLE>
</HEAD>
<BODY>
<H1>Device list</H1>
<TT>
<?php
    include('yocto_api.php');
    yRegisterHub("http://127.0.0.1:4444/");
    $module   = yFirstModule();
    while (!is_null($module)) {
        printf("%s (%s)<br>", $module->get_serialNumber(),
```

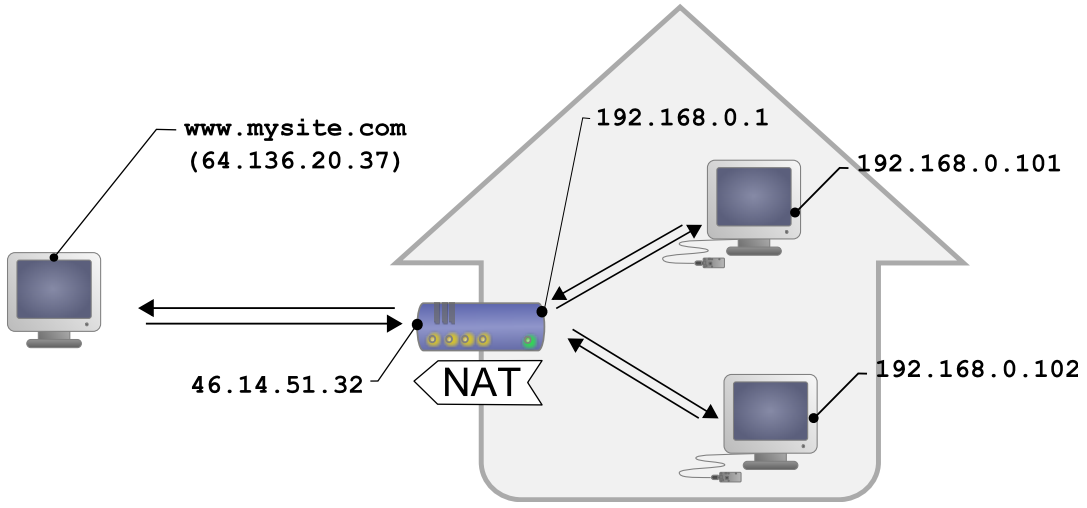
```
                $module->get_productName());
        $module=$module->nextModule();
    }
?>
</TT>
</BODY>
</HTML>
```

9.4. HTTP callback API and NAT filters

The PHP library is able to work in a specific mode called *HTTP callback Yocto-API*. With this mode, you can control Yoctopuce devices installed behind a NAT filter, such as a DSL router for example, and this without needing to open a port. The typical application is to control Yoctopuce devices, located on a private network, from a public web site.

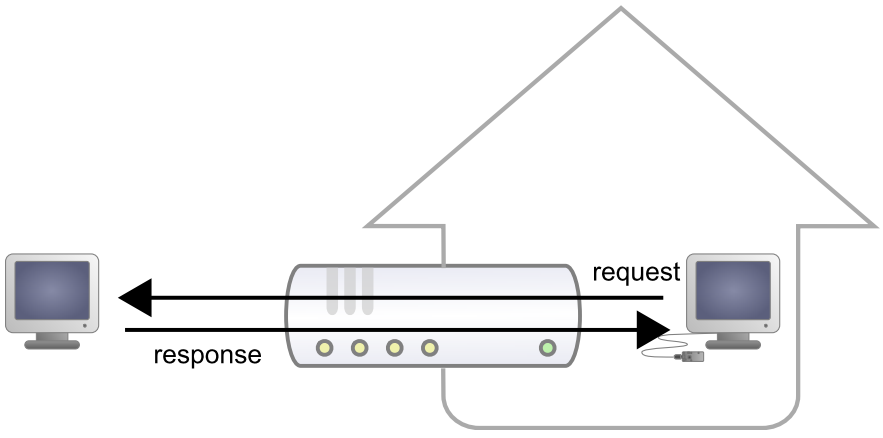
The NAT filter: advantages and disadvantages

A DSL router which translates network addresses (NAT) works somewhat like a private phone switchboard (a PBX): internal extensions can call each other and call the outside; but seen from the outside, there is only one official phone number, that of the switchboard itself. You cannot reach the internal extensions from the outside.

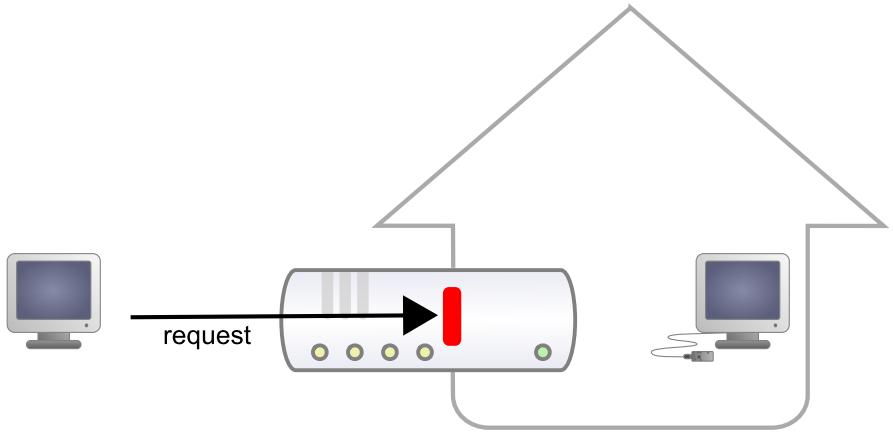


Typical DSL configuration: LAN machines are isolated from the outside by the DSL router

Transposed to the network, we have the following: appliances connected to your home automation network can communicate with one another using a local IP address (of the 192.168.xxx.yyy type), and contact Internet servers through their public address. However, seen from the outside, you have only one official IP address, assigned to the DSL router only, and you cannot reach your network appliances directly from the outside. It is rather restrictive, but it is a relatively efficient protection against intrusions.



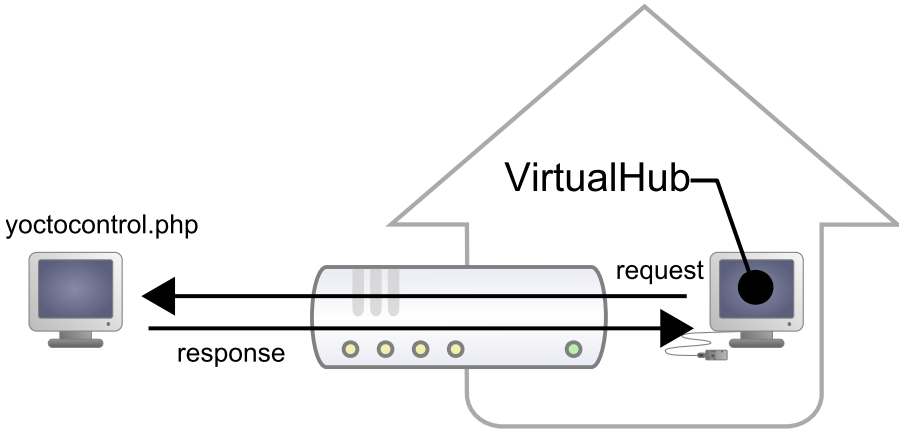
Responses from request from LAN machines are routed.



But requests from the outside are blocked.

Seeing Internet without being seen provides an enormous security advantage. However, this signifies that you cannot, a priori, set up your own web server at home to control a home automation installation from the outside. A solution to this problem, advised by numerous home automation system dealers, consists in providing outside visibility to your home automation server itself, by adding a routing rule in the NAT configuration of the DSL router. The issue of this solution is that it exposes the home automation server to external attacks.

The HTTP callback API solves this issue without having to modify the DSL router configuration. The module control script is located on an external site, and it is the *VirtualHub* which is in charge of calling it a regular intervals.



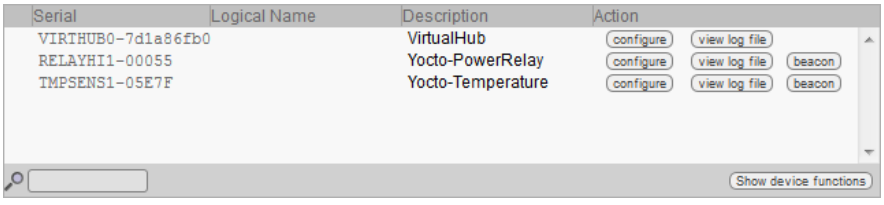
The HTTP callback API uses the VirtualHub which initiates the requests.

Configuration

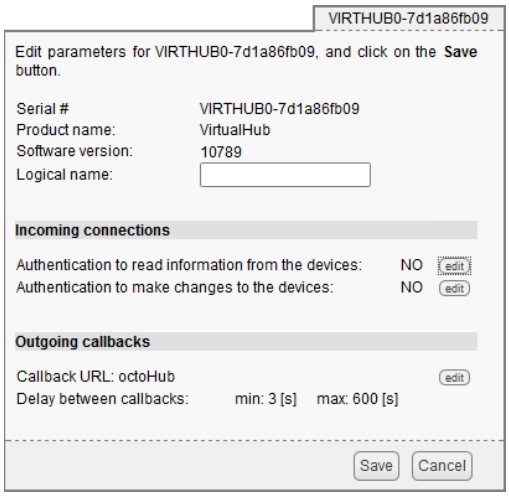
The callback API thus uses the *VirtualHub* as a gateway. All the communications are initiated by the *VirtualHub*. They are thus outgoing communications and therefore perfectly authorized by the DSL router.

You must configure the *VirtualHub* so that it calls the PHP script on a regular basis. To do so:

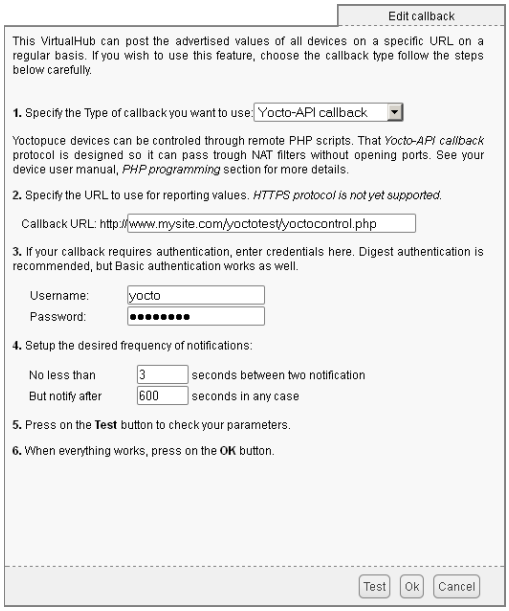
1. Launch a *VirtualHub*
2. Access its interface, usually 127.0.0.1:4444
3. Click on the **configure** button of the line corresponding to the *VirtualHub* itself
4. Click on the **edit** button of the **Outgoing callbacks** section



Click on the "configure" button on the first line



Click on the "edit" button of the "Outgoing callbacks" section


Edit callback
This VirtualHub can post the advertised values of all devices on a specific URL on a regular basis. If you wish to use this feature, choose the callback type follow the steps below carefully.
1. Specify the Type of callback you want to use:
Yocto-API callback
Yoctopuce devices can be controled through remote PHP scripts. That Yocto-API callback protocol is designed so it can pass trough NAT filters without opening ports. See your device user manual, PHP programming section for more details.
2. Specify the URL to use for reporting values. HTTPS protocol is not yet supported.
Callback URL: http://
www.mysite.com/yoctotest/yoctocontrol.php
3. If your callback requires authentication, enter credentials here. Digest authentication is recommended, but Basic authentication works as well.
Username:
yocto
Password:
4. Setup the desired frequency of notifications:
No less than
3
seconds between two notification
But notify after
600
seconds in any case
5. Press on the Test button to check your parameters.
6. When everything works, press on the OK button.
Test
Ok
Cancel

And select "Yocto-API callback".

You then only need to define the URL of the PHP script and, if need be, the user name and password to access this URL. Supported authentication methods are *basic* and *digest*. The second method is safer than the first one because it does not allow transfer of the password on the network.

Usage

From the programmer standpoint, the only difference is at the level of the *yRegisterHub* function call. Instead of using an IP address, you must use the *callback* string (or *http://callback* which is equivalent).

```
include("yocto_api.php");
yRegisterHub("callback");
```

The remainder of the code stays strictly identical. On the *VirtualHub* interface, at the bottom of the configuration window for the HTTP callback API , there is a button allowing you to test the call to the PHP script.

Be aware that the PHP script controlling the modules remotely through the HTTP callback API can be called only by the *VirtualHub*. Indeed, it requires the information posted by the *VirtualHub* to function. To code a web site which controls Yoctopuce modules interactively, you must create a user interface which stores in a file or in a database the actions to be performed on the Yoctopuce modules. These actions are then read and run by the control script.

Common issues

For the HTTP callback API to work, the PHP option *allow_url_fopen* must be set. Some web site hosts do not set it by default. The problem then manifests itself with the following error:

```
error: URL file-access is disabled in the server configuration
```

To set this option, you must create, in the repertory where the control PHP script is located, an *.htaccess* file containing the following line:

```
php_flag "allow_url_fopen" "On"
```

Depending on the security policies of the host, it is sometimes impossible to authorize this option at the root of the web site, or even to install PHP scripts receiving data from a POST HTTP. In this case, place the PHP script in a subdirectory.

Limitations

This method that allows you to go through NAT filters cheaply has nevertheless a price. Communications being initiated by the *VirtualHub* at a more or less regular interval, reaction time to an event is clearly longer than if the Yoctopuce modules were driven directly. You can configure the reaction time in the specific window of the *VirtualHub*, but it is at least of a few seconds in the best case.

The *HTTP callback Yocto-API* mode is currently available in PHP and Node.JS only.

9.5. Error handling

When you implement a program which must interact with USB modules, you cannot disregard error handling. Inevitably, there will be a time when a user will have unplugged the device, either before running the software, or even while the software is running. The Yoctopuce library is designed to help you support this kind of behavior, but your code must nevertheless be conceived to interpret in the best possible way the errors indicated by the library.

The simplest way to work around the problem is the one used in the short examples provided in this chapter: before accessing a module, check that it is online with the `isOnline` function, and then hope that it will stay so during the fraction of a second necessary for the following code lines to run. This method is not perfect, but it can be sufficient in some cases. You must however be aware that you cannot completely exclude an error which would occur after the call to `isOnline` and which could crash the software. The only way to prevent this is to implement one of the two error handling techniques described below.

The method recommended by most programming languages for unpredictable error handling is the use of exceptions. By default, it is the behavior of the Yoctopuce library. If an error happens while you try to access a module, the library throws an exception. In this case, there are three possibilities:

- If your code catches the exception and handles it, everything goes well.
- If your program is running in debug mode, you can relatively easily determine where the problem happened and view the explanatory message linked to the exception.
- Otherwise... the exception makes your program crash, bang!

As this latest situation is not the most desirable, the Yoctopuce library offers another possibility for error handling, allowing you to create a robust program without needing to catch exceptions at every line of code. You simply need to call the `yDisableExceptions()` function to commute the library to a mode where exceptions for all the functions are systematically replaced by specific return values, which can be tested by the caller when necessary. For each function, the name of each return value in case of error is systematically documented in the library reference. The name always follows the same logic: a `get_state()` method returns a `Y_STATE_INVALID` value, a `get_currentValue` method returns a `Y_CURRENTVALUE_INVALID` value, and so on. In any case, the returned value is of the expected type and is not a null pointer which would risk crashing your program. At worst, if you display the value without testing it, it will be outside the expected

bounds for the returned value. In the case of functions which do not normally return information, the return value is `YAPI_SUCCESS` if everything went well, and a different error code in case of failure.

When you work without exceptions, you can obtain an error code and an error message explaining the source of the error. You can request them from the object which returned the error, calling the `errType()` and `errMessage()` methods. Their returned values contain the same information as in the exceptions when they are active.

10. Using Yocto-Relay with C++

C++ is not the simplest language to master. However, if you take care to limit yourself to its essential functionalities, this language can very well be used for short programs quickly coded, and it has the advantage of being easily ported from one operating system to another. Under Windows, all the examples and the project models are tested with Microsoft Visual Studio 2010 Express, freely available on the Microsoft web site[1]. Under Mac OS X, all the examples and project models are tested with XCode 4, available on the App Store. Moreover, under Max OS X and under Linux, you can compile the examples using a command line with GCC using the provided `GNUmakefile`. In the same manner under Windows, a `Makefile` allows you to compile examples using a command line, fully knowing the compilation and linking arguments.

Yoctopuce C++ libraries[2] are integrally provided as source files. A section of the low-level library is written in pure C, but you should not need to interact directly with it: everything was done to ensure the simplest possible interaction from C++. The library is naturally also available as binary files, so that you can link it directly if you prefer.

You will soon notice that the C++ API defines many functions which return objects. You do not need to deallocate these objects yourself, the API does it automatically at the end of the application.

In order to keep them simple, all the examples provided in this documentation are console applications. Naturally, the libraries function in a strictly identical manner if you integrate them in an application with a graphical interface. You will find in the last section of this chapter all the information needed to create a wholly new project linked with the Yoctopuce libraries.

10.1. Control of the Relay function

A few lines of code are enough to use a Yocto-Relay. Here is the skeleton of a C++ code snipplet to use the Relay function.

```
#include "yocto_api.h"
#include "yocto_relay.h"

[...]
String  errmsg;
YRelay *relay;

// Get access to your device, connected locally on USB for instance
yRegisterHub("usb", errmsg);
relay = yFindRelay("RELAYLO1-123456.relay1");
```

[1] http://www.microsoft.com/visualstudio/en-us/products/2010-editions/visual-cpp-express
[2] www.yoctopuce.com/EN/libraries.php

```
// Hot-plug is easy: just check that the device is online
if(relay->isOnline())
{
    // Use relay->set_state(), ...
}
```

Let's look at these lines in more details.

yocto_api.h et yocto_relay.h

These two include files provide access to the functions allowing you to manage Yoctopuce modules. `yocto_api.h` must always be used, `yocto_relay.h` is necessary to manage modules containing a relay, such as Yocto-Relay.

yRegisterHub

The `yRegisterHub` function initializes the Yoctopuce API and indicates where the modules should be looked for. When used with the parameter `"usb"`, it will use the modules locally connected to the computer running the library. If the initialization does not succeed, this function returns a value different from `YAPI_SUCCESS` and `errmsg` contains the error message.

yFindRelay

The `yFindRelay` function allows you to find a relay from the serial number of the module on which it resides and from its function name. You can use logical names as well, as long as you have initialized them. Let us imagine a Yocto-Relay module with serial number *RELAYLO1-123456* which you have named "*MyModule*", and for which you have given the *relay1* function the name "*MyFunction*". The following five calls are strictly equivalent, as long as "*MyFunction*" is defined only once.

```
YRelay *relay = yFindRelay("RELAYLO1-123456.relay1");
YRelay *relay = yFindRelay("RELAYLO1-123456.MyFunction");
YRelay *relay = yFindRelay("MyModule.relay1");
YRelay *relay = yFindRelay("MyModule.MyFunction");
YRelay *relay = yFindRelay("MyFunction");
```

`yFindRelay` returns an object which you can then use at will to control the relay.

isOnline

The `isOnline()` method of the object returned by `yFindRelay` allows you to know if the corresponding module is present and in working order.

set_state

The `set_state()` method of the objet returned by `yFindRelay` switches the relay position to one of its two outputs. The two possible parameter values are `Y_STATE_A` for output A, and `Y_STATE_B` for output B.

A real example

Launch your C++ environment and open the corresponding sample project provided in the directory **Examples/Doc-GettingStarted-Yocto-Relay** of the Yoctopuce library. If you prefer to work with your favorite text editor, open the file `main.cpp`, and type `make` to build the example when you are done.

In this example, you will recognize the functions explained above, but this time used with all side materials needed to make it work nicely as a small demo.

```
#include "yocto_api.h"
#include "yocto_relay.h"
#include <iostream>
#include <ctype.h>
#include <stdlib.h>

using namespace std;
```

```
static void usage(void)
{
    cout << "usage: demo <serial_number>  [ A | B ]" << endl;
    cout << "       demo <logical_name> [ A | B ]" << endl;
    cout << "       demo any [ A | B ]                (use any discovered device)" << endl;
    u64 now = yGetTickCount();    // dirty active wait loop
        while (yGetTickCount()-now<3000);
    exit(1);
}

int main(int argc, const char * argv[])
{
    string  errmsg;
    string  target;
    YRelay  *relay;
    char    state;

    if (argc < 3) {
        usage();
    }
    target = (string) argv[1];
    state = toupper(argv[2][0]);

    // Setup the API to use local USB devices
    if (yRegisterHub("usb", errmsg) != YAPI_SUCCESS) {
        cerr << "RegisterHub error: " << errmsg << endl;
        return 1;
    }

    if (target == "any") {
        relay =  yFirstRelay();
        if (relay==NULL) {
            cout << "No module connected (check USB cable)" << endl;
            return 1;
        }
    }else{
        relay =  yFindRelay(target + ".relay1");
    }

    if (relay->isOnline()) {
        relay->set_state(state == 'A' ? Y_STATE_A : Y_STATE_B);
    } else {
        cout << "Module not connected (check identification and USB cable)" << endl;
    }

    return 0;
}
```

10.2. Control of the module part

Each module can be controlled in a similar manner, you can find below a simple sample program displaying the main parameters of the module and enabling you to activate the localization beacon.

```
#include <iostream>
#include <stdlib.h>

#include "yocto_api.h"

using namespace std;

static void usage(const char *exe)
{
    cout << "usage: " << exe << " <serial or logical name> [ON/OFF]" << endl;
    exit(1);
}


int main(int argc, const char * argv[])
{
    string      errmsg;

    // Setup the API to use local USB devices
```

```
    if(yRegisterHub("usb", errmsg) != YAPI_SUCCESS) {
        cerr << "RegisterHub error: " << errmsg << endl;
        return 1;
    }

    if(argc < 2)
        usage(argv[0]);

    YModule *module = yFindModule(argv[1]);  // use serial or logical name

    if (module->isOnline()) {
        if (argc > 2) {
            if (string(argv[2]) == "ON")
                module->set_beacon(Y_BEACON_ON);
            else
                module->set_beacon(Y_BEACON_OFF);
        }
        cout << "serial:       " << module->get_serialNumber() << endl;
        cout << "logical name: " << module->get_logicalName() << endl;
        cout << "luminosity:   " << module->get_luminosity() << endl;
        cout << "beacon:       ";
        if (module->get_beacon()==Y_BEACON_ON)
           cout << "ON" << endl;
        else
           cout << "OFF" << endl;
        cout << "upTime:       " << module->get_upTime()/1000 << " sec" << endl;
        cout << "USB current:  " << module->get_usbCurrent() << " mA" << endl;
        cout << "Logs:"<< endl << module->get_lastLogs() << endl;
    } else {
        cout << argv[1] << " not connected (check identification and USB cable)"
             << endl;
    }
    return 0;
}
```

Each property `xxx` of the module can be read thanks to a method of type `get_xxxx()`, and properties which are not read-only can be modified with the help of the `set_xxx()` method. For more details regarding the used functions, refer to the API chapters.

Changing the module settings

When you want to modify the settings of a module, you only need to call the corresponding `set_xxx()` function. However, this modification is performed only in the random access memory (RAM) of the module: if the module is restarted, the modifications are lost. To memorize them persistently, it is necessary to ask the module to save its current configuration in its permanent memory. To do so, use the `saveToFlash()` method. Inversely, it is possible to force the module to forget its current settings by using the `revertFromFlash()` method. The short example below allows you to modify the logical name of a module.

```
#include <iostream>
#include <stdlib.h>

#include "yocto_api.h"

using namespace std;

static void usage(const char *exe)
{
    cerr << "usage: " << exe << " <serial> <newLogicalName>" << endl;
    exit(1);
}

int main(int argc, const char * argv[])
{
    string      errmsg;

    // Setup the API to use local USB devices
    if(yRegisterHub("usb", errmsg) != YAPI_SUCCESS) {
        cerr << "RegisterHub error: " << errmsg << endl;
        return 1;
    }

    if(argc < 2)
        usage(argv[0]);
```

```
    YModule *module = yFindModule(argv[1]);  // use serial or logical name

    if (module->isOnline()) {
        if (argc >= 3){
            string newname =  argv[2];
            if (!yCheckLogicalName(newname)){
                cerr << "Invalid name (" << newname << ")" << endl;
                usage(argv[0]);
            }
            module->set_logicalName(newname);
            module->saveToFlash();
        }
        cout << "Current name: " << module->get_logicalName() << endl;
    } else {
        cout << argv[1] << " not connected (check identification and USB cable)"
             << endl;
    }
    return 0;
}
```

Warning: the number of write cycles of the nonvolatile memory of the module is limited. When this limit is reached, nothing guaranties that the saving process is performed correctly. This limit, linked to the technology employed by the module micro-processor, is located at about 100000 cycles. In short, you can use the `saveToFlash()` function only 100000 times in the life of the module. Make sure you do not call this function within a loop.

Listing the modules

Obtaining the list of the connected modules is performed with the `yFirstModule()` function which returns the first module found. Then, you only need to call the `nextModule()` function of this object to find the following modules, and this as long as the returned value is not `NULL`. Below a short example listing the connected modules.

```
#include <iostream>

#include "yocto_api.h"

using namespace std;

int main(int argc, const char * argv[])
{
    string      errmsg;

    // Setup the API to use local USB devices
    if(yRegisterHub("usb", errmsg) != YAPI_SUCCESS) {
        cerr << "RegisterHub error: " << errmsg << endl;
        return 1;
    }

    cout << "Device list: " << endl;

    YModule *module = yFirstModule();
    while (module != NULL) {
        cout << module->get_serialNumber() << " ";
        cout << module->get_productName()  << endl;
        module = module->nextModule();
    }
    return 0;
}
```

10.3. Error handling

When you implement a program which must interact with USB modules, you cannot disregard error handling. Inevitably, there will be a time when a user will have unplugged the device, either before running the software, or even while the software is running. The Yoctopuce library is designed to help you support this kind of behavior, but your code must nevertheless be conceived to interpret in the best possible way the errors indicated by the library.

The simplest way to work around the problem is the one used in the short examples provided in this chapter: before accessing a module, check that it is online with the `isOnline` function, and then hope that it will stay so during the fraction of a second necessary for the following code lines to run. This method is not perfect, but it can be sufficient in some cases. You must however be aware that you cannot completely exclude an error which would occur after the call to `isOnline` and which could crash the software. The only way to prevent this is to implement one of the two error handling techniques described below.

The method recommended by most programming languages for unpredictable error handling is the use of exceptions. By default, it is the behavior of the Yoctopuce library. If an error happens while you try to access a module, the library throws an exception. In this case, there are three possibilities:

- If your code catches the exception and handles it, everything goes well.
- If your program is running in debug mode, you can relatively easily determine where the problem happened and view the explanatory message linked to the exception.
- Otherwise... the exception makes your program crash, bang!

As this latest situation is not the most desirable, the Yoctopuce library offers another possibility for error handling, allowing you to create a robust program without needing to catch exceptions at every line of code. You simply need to call the `yDisableExceptions()` function to commute the library to a mode where exceptions for all the functions are systematically replaced by specific return values, which can be tested by the caller when necessary. For each function, the name of each return value in case of error is systematically documented in the library reference. The name always follows the same logic: a `get_state()` method returns a `Y_STATE_INVALID` value, a `get_currentValue` method returns a `Y_CURRENTVALUE_INVALID` value, and so on. In any case, the returned value is of the expected type and is not a null pointer which would risk crashing your program. At worst, if you display the value without testing it, it will be outside the expected bounds for the returned value. In the case of functions which do not normally return information, the return value is `YAPI_SUCCESS` if everything went well, and a different error code in case of failure.

When you work without exceptions, you can obtain an error code and an error message explaining the source of the error. You can request them from the object which returned the error, calling the `errType()` and `errMessage()` methods. Their returned values contain the same information as in the exceptions when they are active.

10.4. Integration variants for the C++ Yoctopuce library

Depending on your needs and on your preferences, you can integrate the library into your projects in several distinct manners. This section explains how to implement the different options.

Integration in source format

Integrating all the sources of the library into your projects has several advantages:

- It guaranties the respect of the compilation conventions of your project (32/64 bits, inclusion of debugging symbols, unicode or ASCII characters, etc.);
- It facilitates debugging if you are looking for the cause of a problem linked to the Yoctopuce library;
- It reduces the dependencies on third party components, for example in the case where you would need to recompile this project for another architecture in many years;
- It does not require the installation of a dynamic library specific to Yoctopuce on the final system, everything is in the executable.

To integrate the source code, the easiest way is to simply include the `Sources` directory of your Yoctopuce library into your **IncludePath**, and to add all the files of this directory (including the sub-directory `yapi`) to your project.

For your project to build correctly, you need to link with your project the prerequisite system libraries, that is:

- For Windows: the libraries are added automatically

- For Mac OS X: **IOKit.framework** and **CoreFoundation.framework**
- For Linux: **libm**, **libpthread**, **libusb1.0**, and **libstdc++**

Integration as a static library

Integration of the Yoctopuce library as a static library is a simpler manner to build a small executable which uses Yoctopuce modules. You can quickly compile the program with a single command. You do not need to install a dynamic library specific to Yoctopuce, everything is in the executable.

To integrate the static Yoctopuce library to your project, you must include the `Sources` directory of the Yoctopuce library into your **IncludePath**, and add the sub-directory `Binaries/...` corresponding to your operating system into your **libPath**.

Then, for you project to build correctly, you need to link with your project the Yoctopuce library and the prerequisite system libraries:

- For Windows: **yocto-static.lib**
- For Mac OS X: **libyocto-static.a**, **IOKit.framework**, and **CoreFoundation.framework**
- For Linux: **libyocto-static.a**, **libm**, **libpthread**, **libusb1.0**, and **libstdc++**.

Note, under Linux, if you wish to compile in command line with GCC, it is generally advisable to link system libraries as dynamic libraries, rather than as static ones. To mix static and dynamic libraries on the same command line, you must pass the following arguments:

```
gcc (...) -Wl,-Bstatic -lyocto-static -Wl,-Bdynamic -lm -lpthread -lusb-1.0 -lstdc++
```

Integration as a dynamic library

Integration of the Yoctopuce library as a dynamic library allows you to produce an executable smaller than with the two previous methods, and to possibly update this library, if a patch reveals itself necessary, without needing to recompile the source code of the application. On the other hand, it is an integration mode which systematically requires you to copy the dynamic library on the target machine where the application will run (**yocto.dll** for Windows, **libyocto.so.1.0.1** for Mac OS X and Linux).

To integrate the dynamic Yoctopuce library to your project, you must include the `Sources` directory of the Yoctopuce library into your **IncludePath**, and add the sub-directory `Binaries/...` corresponding to your operating system into your **LibPath**.

Then, for you project to build correctly, you need to link with your project the dynamic Yoctopuce library and the prerequisite system libraries:

- For Windows: **yocto.lib**
- For Mac OS X: **libyocto**, **IOKit.framework**, and **CoreFoundation.framework**
- For Linux: **libyocto**, **libm**, **libpthread**, **libusb1.0**, and **libstdc++**.

With GCC, the command line to compile is simply:

```
gcc (...) -lyocto -lm -lpthread -lusb-1.0 -lstdc++
```

11. Using Yocto-Relay with Objective-C

Objective-C is language of choice for programming on Mac OS X, due to its integration with the Cocoa framework. In order to use the Objective-C library, you need XCode version 4.2 (earlier versions will not work), available freely when you run Lion. If you are still under Snow Leopard, you need to be registered as Apple developer to be able to download XCode 4.2. The Yoctopuce library is ARC compatible. You can therefore implement your projects either using the traditional *retain / release* method, or using the *Automatic Reference Counting*.

Yoctopuce Objective-C libraries[1] are integrally provided as source files. A section of the low-level library is written in pure C, but you should not need to interact directly with it: everything was done to ensure the simplest possible interaction from Objective-C.

You will soon notice that the Objective-C API defines many functions which return objects. You do not need to deallocate these objects yourself, the API does it automatically at the end of the application.

In order to keep them simple, all the examples provided in this documentation are console applications. Naturally, the libraries function in a strictly identical manner if you integrate them in an application with a graphical interface. You can find on Yoctopuce blog a detailed example[2] with video shots showing how to integrate the library into your projects.

11.1. Control of the Relay function

Launch Xcode 4.2 and open the corresponding sample project provided in the directory **Examples/ Doc-GettingStarted-Yocto-Relay** of the Yoctopuce library.

```
#import <Foundation/Foundation.h>
#import "yocto_api.h"
#import "yocto_relay.h"

static void usage(void)
{
    NSLog(@"usage: demo <serial_number>  [ A | B ]");
    NSLog(@"       demo <logical_name> [ A | B ]");
    NSLog(@"       demo any [ A | B ]                (use any discovered device)");
    exit(1);
}


int main(int argc, const char * argv[])
```

[1] www.yoctopuce.com/EN/libraries.php
[2] www.yoctopuce.com/EN/article/new-objective-c-library-for-mac-os-x

```
{
    NSError *error;

    if (argc < 3) {
        usage();
    }

    @autoreleasepool {
        // Setup the API to use local USB devices
        if([YAPI RegisterHub:@"usb": &error] != YAPI_SUCCESS) {
            NSLog(@"RegisterHub error: %@", [error localizedDescription]);
            return 1;
        }
        NSString *target = [NSString stringWithUTF8String:argv[1]];
        NSString *state  = [NSString stringWithUTF8String:argv[2]];
        YRelay   *relay;

        if ([target isEqualToString:@"any"]) {
            relay =  [YRelay FirstRelay];
            if (relay==NULL) {
                NSLog(@"No module connected (check USB cable)");
                return 1;
            }
        }else{
            relay =  [YRelay FindRelay:[target stringByAppendingString:@".relay1"]];
        }
        if ([relay isOnline]) {
            if ([state isEqualToString:@"A"])
                [relay set_state:Y_STATE_A];
            else
                [relay set_state:Y_STATE_B];
        } else {
            NSLog(@"Module not connected (check identification and USB cable)\n");
        }
    }
    return 0;
}
```

There are only a few really important lines in this example. We will look at them in details.

yocto_api.h et yocto_relay.h

These two import files provide access to the functions allowing you to manage Yoctopuce modules. `yocto_api.h` must always be used, `yocto_relay.h` is necessary to manage modules containing a relay, such as Yocto-Relay.

yRegisterHub

The `yRegisterHub` function initializes the Yoctopuce API and indicates where the modules should be looked for. When used with the parameter `@"usb"`, it will use the modules locally connected to the computer running the library. If the initialization does not succeed, this function returns a value different from `YAPI_SUCCESS` and `errmsg` contains the error message.

yFindRelay

The `yFindRelay` function allows you to find a relay from the serial number of the module on which it resides and from its function name. You can use logical names as well, as long as you have initialized them. Let us imagine a Yocto-Relay module with serial number *RELAYLO1-123456* which you have named "*MyModule*", and for which you have given the *relay1* function the name "*MyFunction*". The following five calls are strictly equivalent, as long as "*MyFunction*" is defined only once.

```
YRelay *relay = yFindRelay(@"RELAYLO1-123456.relay1");
YRelay *relay = yFindRelay(@"RELAYLO1-123456.MyFunction");
YRelay *relay = yFindRelay(@"MyModule.relay1");
YRelay *relay = yFindRelay(@"MyModule.MyFunction");
YRelay *relay = yFindRelay(@"MyFunction");
```

`yFindRelay` returns an object which you can then use at will to control the relay.

isOnline

The `isOnline()` method of the object returned by `yFindRelay` allows you to know if the corresponding module is present and in working order.

set_state

The `set_state()` method of the objet returned by `yFindRelay` switches the relay position to one of its two outputs. The two possible parameter values are `Y_STATE_A` for output A, and `Y_STATE_B` for output B.

11.2. Control of the module part

Each module can be controlled in a similar manner, you can find below a simple sample program displaying the main parameters of the module and enabling you to activate the localization beacon.

```
#import <Foundation/Foundation.h>
#import "yocto_api.h"

static void usage(const char *exe)
{
    NSLog(@"usage: %s <serial or logical name> [ON/OFF]\n",exe);
    exit(1);
}


int main (int argc, const char * argv[])
{
    NSError *error;

    @autoreleasepool {
        // Setup the API to use local USB devices
        if([YAPI RegisterHub:@"usb": &error] != YAPI_SUCCESS) {
            NSLog(@"RegisterHub error: %@", [error localizedDescription]);
            return 1;
        }
        if(argc < 2)
            usage(argv[0]);
        NSString *serial_or_name =[NSString stringWithUTF8String:argv[1]];
        YModule *module = [YModule FindModule:serial_or_name];  // use serial or logical
name
        if ([module isOnline]) {
            if (argc > 2) {
                if (strcmp(argv[2], "ON")==0)
                    [module setBeacon:Y_BEACON_ON];
                else
                    [module setBeacon:Y_BEACON_OFF];
            }
            NSLog(@"serial:       %@\n", [module serialNumber]);
            NSLog(@"logical name: %@\n", [module logicalName]);
            NSLog(@"luminosity:   %d\n", [module luminosity]);
            NSLog(@"beacon:       ");
            if ([module beacon] == Y_BEACON_ON)
               NSLog(@"ON\n");
            else
               NSLog(@"OFF\n");
            NSLog(@"upTime:       %d sec\n", [module upTime]/1000);
            NSLog(@"USB current:  %d mA\n",  [module usbCurrent]);
            NSLog(@"logs:  %@\n",  [module get_lastLogs]);
        } else {
            NSLog(@"%@ not connected (check identification and USB cable)\n",serial_or_name
);
        }
    }
    return 0;
}
```

Each property `xxx` of the module can be read thanks to a method of type `get_xxxx`, and properties which are not read-only can be modified with the help of the `set_xxx:` method. For more details regarding the used functions, refer to the API chapters.

Changing the module settings

When you want to modify the settings of a module, you only need to call the corresponding `set_xxx:` function. However, this modification is performed only in the random access memory (RAM) of the module: if the module is restarted, the modifications are lost. To memorize them persistently, it is necessary to ask the module to save its current configuration in its permanent memory. To do so, use the `saveToFlash` method. Inversely, it is possible to force the module to forget its current settings by using the `revertFromFlash` method. The short example below allows you to modify the logical name of a module.

```
#import <Foundation/Foundation.h>
#import "yocto_api.h"

static void usage(const char *exe)
{
    NSLog(@"usage: %s <serial> <newLogicalName>\n",exe);
    exit(1);
}


int main (int argc, const char * argv[])
{
    NSError *error;

    @autoreleasepool {
        // Setup the API to use local USB devices
        if(yRegisterHub(@"usb", &error) != YAPI_SUCCESS) {
            NSLog(@"RegisterHub error: %@", [error localizedDescription]);
            return 1;
        }

        if(argc < 2)
            usage(argv[0]);

        NSString *serial_or_name =[NSString stringWithUTF8String:argv[1]];
        YModule *module = yFindModule(serial_or_name);  // use serial or logical name

        if (module.isOnline) {
            if (argc >= 3){
                NSString *newname =  [NSString stringWithUTF8String:argv[2]];
                if (!yCheckLogicalName(newname)){
                    NSLog(@"Invalid name (%@)\n", newname);
                    usage(argv[0]);
                }
                module.logicalName = newname;
                [module saveToFlash];
            }
            NSLog(@"Current name: %@\n", module.logicalName);
        } else {
            NSLog(@"%@ not connected (check identification and USB cable)\n",serial_or_name
);
        }
    }
    return 0;
}
```

Warning: the number of write cycles of the nonvolatile memory of the module is limited. When this limit is reached, nothing guaranties that the saving process is performed correctly. This limit, linked to the technology employed by the module micro-processor, is located at about 100000 cycles. In short, you can use the `saveToFlash` function only 100000 times in the life of the module. Make sure you do not call this function within a loop.

Listing the modules

Obtaining the list of the connected modules is performed with the `yFirstModule()` function which returns the first module found. Then, you only need to call the `nextModule()` function of this object to find the following modules, and this as long as the returned value is not `NULL`. Below a short example listing the connected modules.

```
#import <Foundation/Foundation.h>
#import "yocto_api.h"
```

```
int main (int argc, const char * argv[])
{
    NSError *error;

    @autoreleasepool {
        // Setup the API to use local USB devices
        if(yRegisterHub(@"usb", &error) != YAPI_SUCCESS) {
            NSLog(@"RegisterHub error: %@\n", [error localizedDescription]);
            return 1;
        }

        NSLog(@"Device list:\n");

        YModule *module = yFirstModule();
        while (module != nil) {
            NSLog(@"%@ %@",module.serialNumber, module.productName);
            module = [module nextModule];
        }
    }
    return 0;
}
```

11.3. Error handling

When you implement a program which must interact with USB modules, you cannot disregard error handling. Inevitably, there will be a time when a user will have unplugged the device, either before running the software, or even while the software is running. The Yoctopuce library is designed to help you support this kind of behavior, but your code must nevertheless be conceived to interpret in the best possible way the errors indicated by the library.

The simplest way to work around the problem is the one used in the short examples provided in this chapter: before accessing a module, check that it is online with the `isOnline` function, and then hope that it will stay so during the fraction of a second necessary for the following code lines to run. This method is not perfect, but it can be sufficient in some cases. You must however be aware that you cannot completely exclude an error which would occur after the call to `isOnline` and which could crash the software. The only way to prevent this is to implement one of the two error handling techniques described below.

The method recommended by most programming languages for unpredictable error handling is the use of exceptions. By default, it is the behavior of the Yoctopuce library. If an error happens while you try to access a module, the library throws an exception. In this case, there are three possibilities:

- If your code catches the exception and handles it, everything goes well.
- If your program is running in debug mode, you can relatively easily determine where the problem happened and view the explanatory message linked to the exception.
- Otherwise... the exception makes your program crash, bang!

As this latest situation is not the most desirable, the Yoctopuce library offers another possibility for error handling, allowing you to create a robust program without needing to catch exceptions at every line of code. You simply need to call the `yDisableExceptions()` function to commute the library to a mode where exceptions for all the functions are systematically replaced by specific return values, which can be tested by the caller when necessary. For each function, the name of each return value in case of error is systematically documented in the library reference. The name always follows the same logic: a `get_state()` method returns a `Y_STATE_INVALID` value, a `get_currentValue` method returns a `Y_CURRENTVALUE_INVALID` value, and so on. In any case, the returned value is of the expected type and is not a null pointer which would risk crashing your program. At worst, if you display the value without testing it, it will be outside the expected bounds for the returned value. In the case of functions which do not normally return information, the return value is `YAPI_SUCCESS` if everything went well, and a different error code in case of failure.

When you work without exceptions, you can obtain an error code and an error message explaining the source of the error. You can request them from the object which returned the error, calling the `errType()` and `errMessage()` methods. Their returned values contain the same information as in the exceptions when they are active.

12. Using Yocto-Relay with Visual Basic .NET

VisualBasic has long been the most favored entrance path to the Microsoft world. Therefore, we had to provide our library for this language, even if the new trend is shifting to C#. All the examples and the project models are tested with Microsoft VisualBasic 2010 Express, freely available on the Microsoft web site[1].

12.1. Installation

Download the Visual Basic Yoctopuce library from the Yoctopuce web site[2]. There is no setup program, simply copy the content of the zip file into the directory of your choice. You mostly need the content of the `Sources` directory. The other directories contain the documentation and a few sample programs. All sample projects are Visual Basic 2010, projects, if you are using a previous version, you may have to recreate the projects structure from scratch.

12.2. Using the Yoctopuce API in a Visual Basic project

The Visual Basic.NET Yoctopuce library is composed of a DLL and of source files in Visual Basic. The DLL is not a .NET DLL, but a classic DLL, written in C, which manages the low level communications with the modules[3]. The source files in Visual Basic manage the high level part of the API. Therefore, your need both this DLL and the .vb files of the `sources` directory to create a project managing Yoctopuce modules.

Configuring a Visual Basic project

The following indications are provided for Visual Studio Express 2010, but the process is similar for other versions. Start by creating your project. Then, on the *Solution Explorer* panel, right click on your project, and select "Add" and then "Add an existing item".

A file selection window opens. Select the `yocto_api.vb` file and the files corresponding to the functions of the Yoctopuce modules that your project is going to manage. If in doubt, select all the files.

You then have the choice between simply adding these files to your project, or to add them as links (the **Add** button is in fact a scroll-down menu). In the first case, Visual Studio copies the selected files into your project. In the second case, Visual Studio simply keeps a link on the original files. We recommend you to use links, which makes updates of the library much easier.

[1] http://www.microsoft.com/visualstudio/en-us/products/2010-editions/visual-basic-express
[2] www.yoctopuce.com/EN/libraries.php
[3] The sources of this DLL are available in the C++ API

Then add in the same manner the `yapi.dll` DLL, located in the `Sources/dll` directory[4]. Then, from the **Solution Explorer** window, right click on the DLL, select **Properties** and in the **Properties** panel, set the **Copy to output folder** to **always**. You are now ready to use your Yoctopuce modules from Visual Studio.

In order to keep them simple, all the examples provided in this documentation are console applications. Naturally, the libraries function in a strictly identical manner if you integrate them in an application with a graphical interface.

12.3. Control of the Relay function

A few lines of code are enough to use a Yocto-Relay. Here is the skeleton of a Visual Basic code snipplet to use the Relay function.

```
[...]
Dim errmsg As String errmsg
Dim relay As YRelay

REM Get access to your device, connected locally on USB for instance
yRegisterHub("usb", errmsg)
relay = yFindRelay("RELAYLO1-123456.relay1")

REM Hot-plug is easy: just check that the device is online
If (relay.isOnline()) Then
   REM Use relay.set_state(), ...
End If
```

Let's look at these lines in more details.

yRegisterHub

The `yRegisterHub` function initializes the Yoctopuce API and indicates where the modules should be looked for. When used with the parameter `"usb"`, it will use the modules locally connected to the computer running the library. If the initialization does not succeed, this function returns a value different from `YAPI_SUCCESS` and `errmsg` contains the error message.

yFindRelay

The `yFindRelay` function allows you to find a relay from the serial number of the module on which it resides and from its function name. You can use logical names as well, as long as you have initialized them. Let us imagine a Yocto-Relay module with serial number *RELAYLO1-123456* which you have named "*MyModule*", and for which you have given the *relay1* function the name "*MyFunction*". The following five calls are strictly equivalent, as long as "*MyFunction*" is defined only once.

```
relay = yFindRelay("RELAYLO1-123456.relay1")
relay = yFindRelay("RELAYLO1-123456.MyFunction")
relay = yFindRelay("MyModule.relay1")
relay = yFindRelay("MyModule.MyFunction")
relay = yFindRelay("MyFunction")
```

`yFindRelay` returns an object which you can then use at will to control the relay.

isOnline

The `isOnline()` method of the object returned by `yFindRelay` allows you to know if the corresponding module is present and in working order.

set_state

The `set_state()` method of the objet returned by `yFindRelay` switches the relay position to one of its two outputs. The two possible parameter values are `Y_STATE_A` for output A, and `Y_STATE_B` for output B.

[4] Remember to change the filter of the selection window, otherwise the DLL will not show.

A real example

Launch Microsoft VisualBasic and open the corresponding sample project provided in the directory **Examples/Doc-GettingStarted-Yocto-Relay** of the Yoctopuce library.

In this example, you will recognize the functions explained above, but this time used with all side materials needed to make it work nicely as a small demo.

```
Module Module1

    Private Sub Usage()
        Dim execname = System.AppDomain.CurrentDomain.FriendlyName
        Console.WriteLine("Usage:")
        Console.WriteLine(execname+"  <serial_number>  [ A | B ]")
        Console.WriteLine(execname+"  <logical_name>  [ A | B ]")
        Console.WriteLine(execname+"  any [ A | B ]")
        System.Threading.Thread.Sleep(2500)
        End
    End Sub

    Sub Main()
        Dim argv() As String = System.Environment.GetCommandLineArgs()
        Dim errmsg As String = ""
        Dim target As String
        Dim relay As YRelay
        Dim state As Char

        If argv.Length < 3 Then Usage()

        target = argv(1)
        state = CChar(Mid(argv(2), 1, 1).ToUpper())

        REM Setup the API to use local USB devices
        If (yRegisterHub("usb", errmsg) <> YAPI_SUCCESS) Then
            Console.WriteLine("RegisterHub error: " + errmsg)
            End
        End If

        If target = "any" Then
            relay = yFirstRelay()
            If relay Is Nothing Then
                Console.WriteLine("No module connected (check USB cable) ")
                End
            End If
        Else
            relay = yFindRelay(target + ".relay1")
        End If

        If (relay.isOnline()) Then
            If state = "A" Then relay.set_state(Y_STATE_A) Else relay.set_state(Y_STATE_B)
        Else
            Console.WriteLine("Module not connected (check identification and USB cable)")
        End If
    End Sub

End Module
```

12.4. Control of the module part

Each module can be controlled in a similar manner, you can find below a simple sample program displaying the main parameters of the module and enabling you to activate the localization beacon.

```
Imports System.IO
Imports System.Environment

Module Module1

  Sub usage()
    Console.WriteLine("usage: demo <serial or logical name> [ON/OFF]")
    End
  End Sub
```

```
  Sub Main()
    Dim argv() As String = System.Environment.GetCommandLineArgs()
    Dim errmsg As String = ""
    Dim m As ymodule

    If (yRegisterHub("usb", errmsg) <> YAPI_SUCCESS) Then
      Console.WriteLine("RegisterHub error:" + errmsg)
      End
    End If

    If argv.Length < 2 Then usage()

    m = yFindModule(argv(1)) REM use serial or logical name

    If (m.isOnline()) Then
      If argv.Length > 2 Then
        If argv(2) = "ON" Then m.set_beacon(Y_BEACON_ON)
        If argv(2) = "OFF" Then m.set_beacon(Y_BEACON_OFF)
      End If
      Console.WriteLine("serial:       " + m.get_serialNumber())
      Console.WriteLine("logical name: " + m.get_logicalName())
      Console.WriteLine("luminosity:   " + Str(m.get_luminosity()))
      Console.Write("beacon:       ")
      If (m.get_beacon() = Y_BEACON_ON) Then
        Console.WriteLine("ON")
      Else
        Console.WriteLine("OFF")
      End If
      Console.WriteLine("upTime:       " + Str(m.get_upTime() / 1000) + " sec")
      Console.WriteLine("USB current:  " + Str(m.get_usbCurrent()) + " mA")
      Console.WriteLine("Logs:")
      Console.WriteLine(m.get_lastLogs())
    Else
      Console.WriteLine(argv(1) + " not connected (check identification and USB cable)")
    End If



  End Sub

End Module
```

Each property `xxx` of the module can be read thanks to a method of type `get_xxxx()`, and properties which are not read-only can be modified with the help of the `set_xxx()` method. For more details regarding the used functions, refer to the API chapters.

Changing the module settings

When you want to modify the settings of a module, you only need to call the corresponding `set_xxx()` function. However, this modification is performed only in the random access memory (RAM) of the module: if the module is restarted, the modifications are lost. To memorize them persistently, it is necessary to ask the module to save its current configuration in its permanent memory. To do so, use the `saveToFlash()` method. Inversely, it is possible to force the module to forget its current settings by using the `revertFromFlash()` method. The short example below allows you to modify the logical name of a module.

```
Module Module1


  Sub usage()

    Console.WriteLine("usage: demo <serial or logical name> <new logical name>")
    End
  End Sub

  Sub Main()
    Dim argv() As String = System.Environment.GetCommandLineArgs()
    Dim errmsg As String = ""
    Dim newname As String
    Dim m As YModule

    If (argv.Length <> 3) Then usage()
```

```
    REM Setup the API to use local USB devices
    If yRegisterHub("usb", errmsg) <> YAPI_SUCCESS Then
      Console.WriteLine("RegisterHub error: " + errmsg)
      End
    End If

    m = yFindModule(argv(1)) REM use serial or logical name
    If m.isOnline() Then

      newname = argv(2)
      If (Not yCheckLogicalName(newname)) Then
        Console.WriteLine("Invalid name (" + newname + ")")
        End
      End If
      m.set_logicalName(newname)
      m.saveToFlash() REM do not forget this

      Console.Write("Module: serial= " + m.get_serialNumber)
      Console.Write(" / name= " + m.get_logicalName())
    Else
      Console.Write("not connected (check identification and USB cable")
    End If

  End Sub

End Module
```

Warning: the number of write cycles of the nonvolatile memory of the module is limited. When this limit is reached, nothing guaranties that the saving process is performed correctly. This limit, linked to the technology employed by the module micro-processor, is located at about 100000 cycles. In short, you can use the `saveToFlash()` function only 100000 times in the life of the module. Make sure you do not call this function within a loop.

Listing the modules

Obtaining the list of the connected modules is performed with the `yFirstModule()` function which returns the first module found. Then, you only need to call the `nextModule()` function of this object to find the following modules, and this as long as the returned value is not `Nothing`. Below a short example listing the connected modules.

```
Module Module1

  Sub Main()
    Dim M As ymodule
    Dim errmsg As String = ""

    REM Setup the API to use local USB devices
    If yRegisterHub("usb", errmsg) <> YAPI_SUCCESS Then
      Console.WriteLine("RegisterHub error: " + errmsg)
      End
    End If

    Console.WriteLine("Device list")
    M = yFirstModule()
    While M IsNot Nothing
      Console.WriteLine(M.get_serialNumber() + " (" + M.get_productName() + ")")
      M = M.nextModule()
    End While

  End Sub

    End Module
```

12.5. Error handling

When you implement a program which must interact with USB modules, you cannot disregard error handling. Inevitably, there will be a time when a user will have unplugged the device, either before running the software, or even while the software is running. The Yoctopuce library is designed to help

you support this kind of behavior, but your code must nevertheless be conceived to interpret in the best possible way the errors indicated by the library.

The simplest way to work around the problem is the one used in the short examples provided in this chapter: before accessing a module, check that it is online with the `isOnline` function, and then hope that it will stay so during the fraction of a second necessary for the following code lines to run. This method is not perfect, but it can be sufficient in some cases. You must however be aware that you cannot completely exclude an error which would occur after the call to `isOnline` and which could crash the software. The only way to prevent this is to implement one of the two error handling techniques described below.

The method recommended by most programming languages for unpredictable error handling is the use of exceptions. By default, it is the behavior of the Yoctopuce library. If an error happens while you try to access a module, the library throws an exception. In this case, there are three possibilities:

- If your code catches the exception and handles it, everything goes well.
- If your program is running in debug mode, you can relatively easily determine where the problem happened and view the explanatory message linked to the exception.
- Otherwise... the exception makes your program crash, bang!

As this latest situation is not the most desirable, the Yoctopuce library offers another possibility for error handling, allowing you to create a robust program without needing to catch exceptions at every line of code. You simply need to call the `yDisableExceptions()` function to commute the library to a mode where exceptions for all the functions are systematically replaced by specific return values, which can be tested by the caller when necessary. For each function, the name of each return value in case of error is systematically documented in the library reference. The name always follows the same logic: a `get_state()` method returns a `Y_STATE_INVALID` value, a `get_currentValue` method returns a `Y_CURRENTVALUE_INVALID` value, and so on. In any case, the returned value is of the expected type and is not a null pointer which would risk crashing your program. At worst, if you display the value without testing it, it will be outside the expected bounds for the returned value. In the case of functions which do not normally return information, the return value is `YAPI_SUCCESS` if everything went well, and a different error code in case of failure.

When you work without exceptions, you can obtain an error code and an error message explaining the source of the error. You can request them from the object which returned the error, calling the `errType()` and `errMessage()` methods. Their returned values contain the same information as in the exceptions when they are active.

13. Using Yocto-Relay with C#

C# (pronounced C-Sharp) is an object-oriented programming language promoted by Microsoft, it is somewhat similar to Java. Like Visual-Basic and Delphi, it allows you to create Windows applications quite easily. All the examples and the project models are tested with Microsoft C# 2010 Express, freely available on the Microsoft web site[1].

13.1. Installation

Download the Visual C# Yoctopuce library from the Yoctopuce web site[2]. There is no setup program, simply copy the content of the zip file into the directory of your choice. You mostly need the content of the `Sources` directory. The other directories contain the documentation and a few sample programs. All sample projects are Visual C# 2010, projects, if you are using a previous version, you may have to recreate the projects structure from scratch.

13.2. Using the Yoctopuce API in a Visual C# project

The Visual C#.NET Yoctopuce library is composed of a DLL and of source files in Visual C#. The DLL is not a .NET DLL, but a classic DLL, written in C, which manages the low level communications with the modules[3]. The source files in Visual C# manage the high level part of the API. Therefore, your need both this DLL and the .cs files of the `sources` directory to create a project managing Yoctopuce modules.

Configuring a Visual C# project

The following indications are provided for Visual Studio Express 2010, but the process is similar for other versions. Start by creating your project. Then, on the *Solution Explorer* panel, right click on your project, and select "Add" and then "Add an existing item".

A file selection window opens. Select the `yocto_api.cs` file and the files corresponding to the functions of the Yoctopuce modules that your project is going to manage. If in doubt, select all the files.

You then have the choice between simply adding these files to your project, or to add them as links (the **Add** button is in fact a scroll-down menu). In the first case, Visual Studio copies the selected files into your project. In the second case, Visual Studio simply keeps a link on the original files. We recommend you to use links, which makes updates of the library much easier.

[1] http://www.microsoft.com/visualstudio/en-us/products/2010-editions/visual-csharp-express
[2] www.yoctopuce.com/EN/libraries.php
[3] The sources of this DLL are available in the C++ API

Then add in the same manner the `yapi.dll` DLL, located in the `Sources/dll` directory[4]. Then, from the **Solution Explorer** window, right click on the DLL, select **Properties** and in the **Properties** panel, set the **Copy to output folder** to **always**. You are now ready to use your Yoctopuce modules from Visual Studio.

In order to keep them simple, all the examples provided in this documentation are console applications. Naturally, the libraries function in a strictly identical manner if you integrate them in an application with a graphical interface.

13.3. Control of the Relay function

A few lines of code are enough to use a Yocto-Relay. Here is the skeleton of a C# code snipplet to use the Relay function.

```
[...]
string errmsg ="";
YRelay relay;

// Get access to your device, connected locally on USB for instance
YAPI.RegisterHub("usb", errmsg);
relay = YRelay.FindRelay("RELAYLO1-123456.relay1");

// Hot-plug is easy: just check that the device is online
if (relay.isOnline())
 {  // Use relay.set_state(); ...
 }
```

Let's look at these lines in more details.

YAPI.RegisterHub

The `YAPI.RegisterHub` function initializes the Yoctopuce API and indicates where the modules should be looked for. When used with the parameter `"usb"`, it will use the modules locally connected to the computer running the library. If the initialization does not succeed, this function returns a value different from `YAPI.SUCCESS` and `errmsg` contains the error message.

YRelay.FindRelay

The `YRelay.FindRelay` function allows you to find a relay from the serial number of the module on which it resides and from its function name. You can use logical names as well, as long as you have initialized them. Let us imagine a Yocto-Relay module with serial number *RELAYLO1-123456* which you have named "*MyModule*", and for which you have given the *relay1* function the name "*MyFunction*". The following five calls are strictly equivalent, as long as "*MyFunction*" is defined only once.

```
relay = YRelay.FindRelay("RELAYLO1-123456.relay1");
relay = YRelay.FindRelay("RELAYLO1-123456.MyFunction");
relay = YRelay.FindRelay("MyModule.relay1");
relay = YRelay.FindRelay("MyModule.MyFunction");
relay = YRelay.FindRelay("MyFunction");
```

`YRelay.FindRelay` returns an object which you can then use at will to control the relay.

isOnline

The `isOnline()` method of the object returned by `YRelay.FindRelay` allows you to know if the corresponding module is present and in working order.

set_state

The `set_state()` method of the objet returned by `YRelay.FindRelay` switches the relay position to one of its two outputs. The two possible parameter values are `YRelay.STATE_A` for output A, and `YRelay.STATE_B` for output B.

[4] Remember to change the filter of the selection window, otherwise the DLL will not show.

A real example

Launch Microsoft Visual C# and open the corresponding sample project provided in the directory **Examples/Doc-GettingStarted-Yocto-Relay** of the Yoctopuce library.

In this example, you will recognize the functions explained above, but this time used with all side materials needed to make it work nicely as a small demo.

```
using System;
using System.Collections.Generic;
using System.Linq;
using System.Text;

namespace ConsoleApplication1
{
  class Program
  {
    static void usage()
    { string execname = System.AppDomain.CurrentDomain.FriendlyName;
      Console.WriteLine("Usage:");
      Console.WriteLine(execname+"  <serial_number>  [ A | B ]");
      Console.WriteLine(execname+"  <logical_name>  [ A | B ]");
      Console.WriteLine(execname+"  any [ A | B ]");
      System.Threading.Thread.Sleep(2500);
      Environment.Exit(0);
    }

    static void Main(string[] args)
    {
      string errmsg = "";
      string target;
      YRelay relay;
      string state;

      if (args.Length < 2) usage();
      target = args[0].ToUpper();
      state = args[1].ToUpper();

      if (YAPI.RegisterHub("usb", ref errmsg) != YAPI.SUCCESS)
      {
        Console.WriteLine("RegisterHub error: " + errmsg);
        Environment.Exit(0);
      }

      if (target == "ANY")
      {
        relay = YRelay.FirstRelay();
        if (relay == null)
        {
          Console.WriteLine("No module connected (check USB cable) ");
          Environment.Exit(0);
        }
      }
      else relay = YRelay.FindRelay(target + ".relay1");

      if (relay.isOnline())
      {
        if (state == "A") relay.set_state(YRelay.STATE_A); else relay.set_state
(YRelay.STATE_B);
      }
      else Console.WriteLine("Module not connected (check identification and USB cable)");
    }
  }
}
```

13.4. Control of the module part

Each module can be controlled in a similar manner, you can find below a simple sample program displaying the main parameters of the module and enabling you to activate the localization beacon.

```
using System;
using System.Collections.Generic;
```

```
using System.Linq;
using System.Text;


namespace ConsoleApplication1
{
  class Program
  {
    static void usage()
    { string execname = System.AppDomain.CurrentDomain.FriendlyName;
      Console.WriteLine("Usage:");
      Console.WriteLine(execname+" <serial or logical name> [ON/OFF]");
      System.Threading.Thread.Sleep(2500);
      Environment.Exit(0);
    }

    static void Main(string[] args)
    {
      YModule m;
      string errmsg = "";

      if (YAPI.RegisterHub("usb", ref errmsg) !=  YAPI.SUCCESS)
      {
        Console.WriteLine("RegisterHub error: " + errmsg);
        Environment.Exit(0);
      }


      if (args.Length < 1)  usage();

      m = YModule.FindModule(args[0]); // use serial or logical name

      if (m.isOnline())
      {
        if (args.Length >= 2)
        {
          if (args[1].ToUpper() == "ON") { m.set_beacon(YModule.BEACON_ON); }
          if (args[1].ToUpper() == "OFF") { m.set_beacon(YModule.BEACON_OFF); }
        }

        Console.WriteLine("serial:       " + m.get_serialNumber());
        Console.WriteLine("logical name: " + m.get_logicalName());
        Console.WriteLine("luminosity:   " + m.get_luminosity().ToString());
        Console.Write("beacon:       ");
        if (m.get_beacon() == YModule.BEACON_ON)
          Console.WriteLine("ON");
        else
          Console.WriteLine("OFF");
        Console.WriteLine("upTime:       " + (m.get_upTime() / 1000 ).ToString()+ " sec");
        Console.WriteLine("USB current:  " + m.get_usbCurrent().ToString() + " mA");
        Console.WriteLine("Logs:\r\n"+ m.get_lastLogs());

      }
    else
      Console.WriteLine(args[0] + " not connected (check identification and USB cable)");

   }
  }
}
```

Each property `xxx` of the module can be read thanks to a method of type `YModule.get_xxxx()`, and properties which are not read-only can be modified with the help of the `YModule.set_xxx()` method. For more details regarding the used functions, refer to the API chapters.

Changing the module settings

When you want to modify the settings of a module, you only need to call the corresponding `YModule.set_xxx()` function. However, this modification is performed only in the random access memory (RAM) of the module: if the module is restarted, the modifications are lost. To memorize them persistently, it is necessary to ask the module to save its current configuration in its permanent memory. To do so, use the `YModule.saveToFlash()` method. Inversely, it is possible to force the module to forget its current settings by using the `YModule.revertFromFlash()` method. The short example below allows you to modify the logical name of a module.

```
using System;
using System.Collections.Generic;
using System.Linq;
using System.Text;

namespace ConsoleApplication1
{
  class Program
  {
    static void usage()
    { string execname = System.AppDomain.CurrentDomain.FriendlyName;
      Console.WriteLine("Usage:");
      Console.WriteLine("usage: demo <serial or logical name> <new logical name>");
      System.Threading.Thread.Sleep(2500);
      Environment.Exit(0);
    }

    static void Main(string[] args)
    {
      YModule m;
      string errmsg = "";
      string newname;

      if (args.Length != 2) usage();

      if (YAPI.RegisterHub("usb", ref errmsg) !=  YAPI.SUCCESS)
      {
        Console.WriteLine("RegisterHub error: " + errmsg);
        Environment.Exit(0);
      }

      m = YModule.FindModule(args[0]); // use serial or logical name

      if (m.isOnline())
      {
        newname = args[1];
        if (!YAPI.CheckLogicalName(newname))
        {
          Console.WriteLine("Invalid name (" + newname + ")");
          Environment.Exit(0);
        }

        m.set_logicalName(newname);
        m.saveToFlash(); // do not forget this

        Console.Write("Module: serial= " + m.get_serialNumber());
        Console.WriteLine(" / name= " + m.get_logicalName());
      }
      else
        Console.Write("not connected (check identification and USB cable");
    }
  }
}
```

Warning: the number of write cycles of the nonvolatile memory of the module is limited. When this limit is reached, nothing guaranties that the saving process is performed correctly. This limit, linked to the technology employed by the module micro-processor, is located at about 100000 cycles. In short, you can use the `YModule.saveToFlash()` function only 100000 times in the life of the module. Make sure you do not call this function within a loop.

Listing the modules

Obtaining the list of the connected modules is performed with the `YModule.yFirstModule()` function which returns the first module found. Then, you only need to call the `nextModule()` function of this object to find the following modules, and this as long as the returned value is not `null`. Below a short example listing the connected modules.

```
using System;
using System.Collections.Generic;
using System.Linq;
using System.Text;

namespace ConsoleApplication1
{
```

```
  class Program
  {
    static void Main(string[] args)
    {
      YModule m;
      string errmsg = "";

      if (YAPI.RegisterHub("usb", ref errmsg) !=  YAPI.SUCCESS)
      {
        Console.WriteLine("RegisterHub error: " + errmsg);
        Environment.Exit(0);
      }

      Console.WriteLine("Device list");
      m = YModule.FirstModule();
      while (m!=null)
      { Console.WriteLine(m.get_serialNumber() + " (" + m.get_productName() + ")");
       m = m.nextModule();
      }

    }
  }
}
```

13.5. Error handling

When you implement a program which must interact with USB modules, you cannot disregard error handling. Inevitably, there will be a time when a user will have unplugged the device, either before running the software, or even while the software is running. The Yoctopuce library is designed to help you support this kind of behavior, but your code must nevertheless be conceived to interpret in the best possible way the errors indicated by the library.

The simplest way to work around the problem is the one used in the short examples provided in this chapter: before accessing a module, check that it is online with the `isOnline` function, and then hope that it will stay so during the fraction of a second necessary for the following code lines to run. This method is not perfect, but it can be sufficient in some cases. You must however be aware that you cannot completely exclude an error which would occur after the call to `isOnline` and which could crash the software. The only way to prevent this is to implement one of the two error handling techniques described below.

The method recommended by most programming languages for unpredictable error handling is the use of exceptions. By default, it is the behavior of the Yoctopuce library. If an error happens while you try to access a module, the library throws an exception. In this case, there are three possibilities:

- If your code catches the exception and handles it, everything goes well.
- If your program is running in debug mode, you can relatively easily determine where the problem happened and view the explanatory message linked to the exception.
- Otherwise... the exception makes your program crash, bang!

As this latest situation is not the most desirable, the Yoctopuce library offers another possibility for error handling, allowing you to create a robust program without needing to catch exceptions at every line of code. You simply need to call the `yDisableExceptions()` function to commute the library to a mode where exceptions for all the functions are systematically replaced by specific return values, which can be tested by the caller when necessary. For each function, the name of each return value in case of error is systematically documented in the library reference. The name always follows the same logic: a `get_state()` method returns a `Y_STATE_INVALID` value, a `get_currentValue` method returns a `Y_CURRENTVALUE_INVALID` value, and so on. In any case, the returned value is of the expected type and is not a null pointer which would risk crashing your program. At worst, if you display the value without testing it, it will be outside the expected bounds for the returned value. In the case of functions which do not normally return information, the return value is `YAPI_SUCCESS` if everything went well, and a different error code in case of failure.

When you work without exceptions, you can obtain an error code and an error message explaining the source of the error. You can request them from the object which returned the error, calling the

`errType()` and `errMessage()` methods. Their returned values contain the same information as in the exceptions when they are active.

14. Using Yocto-Relay with Delphi

Delphi is a descendent of Turbo-Pascal. Originally, Delphi was produced by Borland, Embarcadero now edits it. The strength of this language resides in its ease of use, as anyone with some notions of the Pascal language can develop a Windows application in next to no time. Its only disadvantage is to cost something[1].

Delphi libraries are provided not as VCL components, but directly as source files. These files are compatible with most Delphi versions.[2]

To keep them simple, all the examples provided in this documentation are console applications. Obviously, the libraries work in a strictly identical way with VCL applications.

You will soon notice that the Delphi API defines many functions which return objects. You do not need to deallocate these objects yourself, the API does it automatically at the end of the application.

14.1. Preparation

Go to the Yoctopuce web site and download the Yoctopuce Delphi libraries[3]. Uncompress everything in a directory of your choice, add the subdirectory *sources* in the list of directories of Delphi libraries.[4]

By default, the Yoctopuce Delphi library uses the *yapi.dll* DLL, all the applications you will create with Delphi must have access to this DLL. The simplest way to ensure this is to make sure *yapi.dll* is located in the same directory as the executable file of your application.

14.2. Control of the Relay function

Launch your Delphi environment, copy the yapi.dll DLL in a directory, create a new console application in the same directory, and copy-paste the piece of code below:

```
program helloworld;
{$APPTYPE CONSOLE}
uses
  SysUtils,
  yocto_api,
  yocto_relay;
```

[1] Actually, Borland provided free versions (for personal use) of Delphi 2006 and 2007. Look for them on the Internet, you may still be able to download them.
[2] Delphi libraries are regularly tested with Delphi 5 and Delphi XE2.
[3] www.yoctopuce.com/EN/libraries.php
[4] Use the **Tools / Environment options** menu.

```
procedure usage();
  var
    execname:string;
  begin
    execname := ExtractFileName(paramstr(0));
    WriteLn('Usage:');
    WriteLn(execname + ' <serial_number> <channel> [ A | B ]');
    WriteLn(execname + ' <logical_name> <channel>  [ A | B ]');
    WriteLn(execname + ' any <channel> [ A | B ]');
    WriteLn('Example:');
    WriteLn(execname + ' any 2 B');
    sleep(2500);
    halt;
  end;

var
 errmsg,target,state,channel:string;
 relay:TYRelay;
 m : TYModule;

begin
  if (paramcount<3) then usage();

  // parse command line
  target  :=  UpperCase(paramstr(1));
  channel :=  paramstr(2);
  state   :=  UpperCase(paramstr(3));

  // Setup the API to use local USB devices
  if (YRegisterHub('usb', errmsg) <> YAPI_SUCCESS)  then
    begin
      writeln('RegisterHub error: ' + errmsg);
      halt;
    end;

  if (target='ANY') then
    begin
      // try to find the first vavailable relay
      relay :=  YFirstRelay();
      if (relay =nil) then
       begin
         writeln('No module connected (check USB cable)');
         halt;
       end;
      // retreive the hosting device serial
      m :=  relay.get_module();
      target := m. get_serialNumber();
     end;

  Writeln('using ' + target);
  // retreive the right channel
  relay := YFindRelay(target + '.relay'+channel);

  // lets switch the relay
  if (relay.isOnline()) then
    begin
      if (state = 'B') then  relay.set_output(Y_OUTPUT_ON)
                       else relay.set_output(Y_OUTPUT_OFF);
    end
   else writeln('Module not connected (check identification and USB cable)');

end.
```

There are only a few really important lines in this sample example. We will look at them in details.

yocto_api and yocto_relay

These two units provide access to the functions allowing you to manage Yoctopuce modules. `yocto_api` must always be used, `yocto_relay` is necessary to manage modules containing a relay, such as Yocto-Relay.

yRegisterHub

The `yRegisterHub` function initializes the Yoctopuce API and specifies where the modules should be looked for. When used with the parameter `'usb'`, it will use the modules locally connected to the computer running the library. If the initialization does not succeed, this function returns a value different from `YAPI_SUCCESS` and `errmsg` contains the error message.

yFindRelay

The `yFindRelay` function allows you to find a relay from the serial number of the module on which it resides and from its function name. You can also use logical names, as long as you have initialized them. Let us imagine a Yocto-Relay module with serial number *RELAYLO1-123456* which you have named "*MyModule*", and for which you have given the *relay1* function the name "*MyFunction*". The following five calls are strictly equivalent, as long as "*MyFunction*" is defined only once.

```
relay := yFindRelay("RELAYLO1-123456.relay1");
relay := yFindRelay("RELAYLO1-123456.MyFunction");
relay := yFindRelay("MyModule.relay1");
relay := yFindRelay("MyModule.MyFunction");
relay := yFindRelay("MyFunction");
```

`yFindRelay` returns an object which you can then use at will to control the relay.

isOnline

The `isOnline()` method of the object returned by `yFindRelay` allows you to know if the corresponding module is present and in working order.

set_state

The `set_state()` method of the objet returned by `yFindRelay` switches the relay position to one of its two outputs. The two possible parameter values are `Y_STATE_A` for output A, and `Y_STATE_B` for output B.

14.3. Control of the module part

Each module can be controlled in a similar manner, you can find below a simple sample program displaying the main parameters of the module and enabling you to activate the localization beacon.

```
program modulecontrol;
{$APPTYPE CONSOLE}
uses
  SysUtils,
  yocto_api;

const
  serial = 'RELAYLO1-123456'; // use serial number or logical name

procedure refresh(module:Tymodule) ;
  begin
    if (module.isOnline())  then
     begin
       Writeln('');
       Writeln('Serial       : ' + module.get_serialNumber());
       Writeln('Logical name : ' + module.get_logicalName());
       Writeln('Luminosity   : ' + intToStr(module.get_luminosity()));
       Write('Beacon     :');
       if  (module.get_beacon()=Y_BEACON_ON) then Writeln('on')
                                             else Writeln('off');
       Writeln('uptime       : ' + intToStr(module.get_upTime() div 1000)+'s');
       Writeln('USB current  : ' + intToStr(module.get_usbCurrent())+'mA');
       Writeln('Logs         : ');
       Writeln(module.get_lastlogs());
       Writeln('');
       Writeln('r : refresh / b:beacon ON / space : beacon off');
     end
    else Writeln('Module not connected (check identification and USB cable)');
  end;
```

```
procedure beacon(module:Tymodule;state:integer);
  begin
    module.set_beacon(state);
    refresh(module);
  end;

var
  module : TYModule;
  c      : char;
  errmsg : string;

begin
  // Setup the API to use local USB devices
  if yRegisterHub('usb', errmsg)<>YAPI_SUCCESS then
  begin
    Write('RegisterHub error: '+errmsg);
    exit;
  end;

  module := yFindModule(serial);
  refresh(module);

  repeat
    read(c);
    case c of
     'r': refresh(module);
     'b': beacon(module,Y_BEACON_ON);
     ' ': beacon(module,Y_BEACON_OFF);
    end;
  until  c = 'x';
end.
```

Each property `xxx` of the module can be read thanks to a method of type `get_xxxx()`, and properties which are not read-only can be modified with the help of the `set_xxx()` method. For more details regarding the used functions, refer to the API chapters.

Changing the module settings

When you want to modify the settings of a module, you only need to call the corresponding `set_xxx()` function. However, this modification is performed only in the random access memory (RAM) of the module: if the module is restarted, the modifications are lost. To memorize them persistently, it is necessary to ask the module to save its current configuration in its permanent memory. To do so, use the `saveToFlash()` method. Inversely, it is possible to force the module to forget its current settings by using the `revertFromFlash()` method. The short example below allows you to modify the logical name of a module.

```
program savesettings;
{$APPTYPE CONSOLE}
uses
  SysUtils,
  yocto_api;

const
  serial = 'RELAYLO1-123456'; // use serial number or logical name

var
  module  : TYModule;
  errmsg  : string;
  newname : string;

begin
  // Setup the API to use local USB devices
  if yRegisterHub('usb', errmsg)<>YAPI_SUCCESS then
  begin
    Write('RegisterHub error: '+errmsg);
    exit;
  end;

  module := yFindModule(serial);
  if (not(module.isOnline)) then
   begin
     writeln('Module not connected (check identification and USB cable)');
     exit;
   end;
```

```
  Writeln('Current logical name : '+module.get_logicalName());
  Write('Enter new name : ');
  Readln(newname);
  if (not(yCheckLogicalName(newname))) then
   begin
     Writeln('invalid logical name');
     exit;
   end;
  module.set_logicalName(newname);
  module.saveToFlash();

  Writeln('logical name is now : '+module.get_logicalName());
end.
```

Warning: the number of write cycles of the nonvolatile memory of the module is limited. When this limit is reached, nothing guaranties that the saving process is performed correctly. This limit, linked to the technology employed by the module micro-processor, is located at about 100000 cycles. In short, you can use the `saveToFlash()` function only 100000 times in the life of the module. Make sure you do not call this function within a loop.

Listing the modules

Obtaining the list of the connected modules is performed with the `yFirstModule()` function which returns the first module found. Then, you only need to call the `nextModule()` function of this object to find the following modules, and this as long as the returned value is not `nil`. Below a short example listing the connected modules.

```
program inventory;
{$APPTYPE CONSOLE}
uses
  SysUtils,
  yocto_api;

var
  module : TYModule;
  errmsg : string;

begin
  // Setup the API to use local USB devices
  if yRegisterHub('usb', errmsg)<>YAPI_SUCCESS then
  begin
    Write('RegisterHub error: '+errmsg);
    exit;
  end;

  Writeln('Device list');

  module := yFirstModule();
  while module<>nil  do
   begin
     Writeln( module.get_serialNumber()+' ('+module.get_productName()+')');
     module := module.nextModule();
   end;

end.
```

14.4. Error handling

When you implement a program which must interact with USB modules, you cannot disregard error handling. Inevitably, there will be a time when a user will have unplugged the device, either before running the software, or even while the software is running. The Yoctopuce library is designed to help you support this kind of behavior, but your code must nevertheless be conceived to interpret in the best possible way the errors indicated by the library.

The simplest way to work around the problem is the one used in the short examples provided in this chapter: before accessing a module, check that it is online with the `isOnline` function, and then hope that it will stay so during the fraction of a second necessary for the following code lines to run.

This method is not perfect, but it can be sufficient in some cases. You must however be aware that you cannot completely exclude an error which would occur after the call to `isOnline` and which could crash the software. The only way to prevent this is to implement one of the two error handling techniques described below.

The method recommended by most programming languages for unpredictable error handling is the use of exceptions. By default, it is the behavior of the Yoctopuce library. If an error happens while you try to access a module, the library throws an exception. In this case, there are three possibilities:

- If your code catches the exception and handles it, everything goes well.
- If your program is running in debug mode, you can relatively easily determine where the problem happened and view the explanatory message linked to the exception.
- Otherwise... the exception makes your program crash, bang!

As this latest situation is not the most desirable, the Yoctopuce library offers another possibility for error handling, allowing you to create a robust program without needing to catch exceptions at every line of code. You simply need to call the `yDisableExceptions()` function to commute the library to a mode where exceptions for all the functions are systematically replaced by specific return values, which can be tested by the caller when necessary. For each function, the name of each return value in case of error is systematically documented in the library reference. The name always follows the same logic: a `get_state()` method returns a `Y_STATE_INVALID` value, a `get_currentValue` method returns a `Y_CURRENTVALUE_INVALID` value, and so on. In any case, the returned value is of the expected type and is not a null pointer which would risk crashing your program. At worst, if you display the value without testing it, it will be outside the expected bounds for the returned value. In the case of functions which do not normally return information, the return value is `YAPI_SUCCESS` if everything went well, and a different error code in case of failure.

When you work without exceptions, you can obtain an error code and an error message explaining the source of the error. You can request them from the object which returned the error, calling the `errType()` and `errMessage()` methods. Their returned values contain the same information as in the exceptions when they are active.

15. Using the Yocto-Relay with Python

Python is an interpreted object oriented language developed by Guido van Rossum. Among its advantages is the fact that it is free, and the fact that it is available for most platforms, Windows as well as UNIX. It is an ideal language to write small scripts on a napkin. The Yoctopuce library is compatible with Python 2.6+ and 3+. It works under Windows, Mac OS X, and Linux, Intel as well as ARM. The library was tested with Python 2.6 and Python 3.2. Python interpreters are available on the Python web site[1].

15.1. Source files

The Yoctopuce library classes[2] for Python that you will use are provided as source files. Copy all the content of the *Sources* directory in the directory of your choice and add this directory to the *PYTHONPATH* environment variable. If you use an IDE to program in Python, refer to its documentation to configure it so that it automatically finds the API source files.

15.2. Dynamic library

A section of the low-level library is written in C, but you should not need to interact directly with it: it is provided as a DLL under Windows, as a *.so* files under UNIX, and as a *.dylib* file under Mac OS X. Everything was done to ensure the simplest possible interaction from Python: the distinct versions of the dynamic library corresponding to the distinct operating systems and architectures are stored in the *cdll* directory. The API automatically loads the correct file during its initialization. You should not have to worry about it.

If you ever need to recompile the dynamic library, its complete source code is located in the Yoctopuce C++ library.

In order to keep them simple, all the examples provided in this documentation are console applications. Naturally, the libraries function in a strictly identical manner if you integrate them in an application with a graphical interface.

15.3. Control of the Relay function

A few lines of code are enough to use a Yocto-Relay. Here is the skeleton of a Python code snipplet to use the Relay function.

[1] http://www.python.org/download/
[2] www.yoctopuce.com/EN/libraries.php

```
[...]

errmsg=YRefParam()
#Get access to your device, connected locally on USB for instance
YAPI.RegisterHub("usb",errmsg)
relay = YRelay.FindRelay("RELAYLO1-123456.relay1")

# Hot-plug is easy: just check that the device is online
if relay.isOnline():
    #Use relay.set_state()
    ...

[...]
```

Let's look at these lines in more details.

YAPI.RegisterHub

The `yAPI.RegisterHub` function initializes the Yoctopuce API and indicates where the modules should be looked for. When used with the parameter "`usb`", it will use the modules locally connected to the computer running the library. If the initialization does not succeed, this function returns a value different from `YAPI.SUCCESS` and `errmsg` contains the error message.

YRelay.FindRelay

The `YRelay.FindRelay` function allows you to find a relay from the serial number of the module on which it resides and from its function name. You can use logical names as well, as long as you have initialized them. Let us imagine a Yocto-Relay module with serial number *RELAYLO1-123456* which you have named "*MyModule*", and for which you have given the *relay1* function the name "*MyFunction*". The following five calls are strictly equivalent, as long as "*MyFunction*" is defined only once.

```
relay = YRelay.FindRelay("RELAYLO1-123456.relay1")
relay = YRelay.FindRelay("RELAYLO1-123456.MyFunction")
relay = YRelay.FindRelay("MyModule.relay1")
relay = YRelay.FindRelay("MyModule.MyFunction")
relay = YRelay.FindRelay("MyFunction")
```

`YRelay.FindRelay` returns an object which you can then use at will to control the relay.

isOnline

The `isOnline()` method of the object returned by `YRelay.FindRelay` allows you to know if the corresponding module is present and in working order.

set_state

The `set_state()` method of the objet returned by `YRelay.FindRelay` switches the relay position to one of its two outputs. The two possible parameter values are `YRelay.STATE_A` for output A, and `YRelay.STATE_B` for output B.

A real example

Launch Python and open the corresponding sample script provided in the directory **Examples/Doc-GettingStarted-Yocto-Relay** of the Yoctopuce library.

In this example, you will recognize the functions explained above, but this time used with all side materials needed to make it work nicely as a small demo.

```
#!/usr/bin/python
# -*- coding: utf-8 -*-
import os,sys
from yocto_api import *
from yocto_relay import *

def usage():
    scriptname = os.path.basename(sys.argv[0])
    print("Usage:")
```

```
    print(scriptname + ' <serial_number> <channel> [ A | B ]')
    print(scriptname + ' <logical_name> <channel>  [ A | B ]')
    print(scriptname + ' any <channel> [ A | B ]')
    print('Example:')
    print(scriptname + ' any 2 B')
    sys.exit()

def die(msg):
    sys.exit(msg+' (check USB cable)')

if len(sys.argv)<3 :  usage()

target=sys.argv[1].upper()
channel=sys.argv[2]
state=sys.argv[3].upper()

# Setup the API to use local USB devices
errmsg=YRefParam()
if YAPI.RegisterHub("usb", errmsg)!= YAPI.SUCCESS:
    sys.exit("init error"+errmsg.value)

if target=='ANY':
    # retreive any Relay then find its serial #
    relay = YRelay.FirstRelay()
    if relay is None : die('No module connected')
    m=relay.get_module()
    target = m.get_serialNumber()

print('using ' + target)
relay = YRelay.FindRelay(target + '.relay'+channel)

if not(relay.isOnline()):die('device not connected')

if state == 'A' :
    relay.set_state(YRelay.STATE_A)
else:
    relay.set_output(YRelay.STATE_B)
```

15.4. Control of the module part

Each module can be controlled in a similar manner, you can find below a simple sample program displaying the main parameters of the module and enabling you to activate the localization beacon.

```
#!/usr/bin/python
# -*- coding: utf-8 -*-
import os,sys
from yocto_api import *


def usage():
    sys.exit("usage: demo <serial or logical name> [ON/OFF]")

errmsg =YRefParam()
if YAPI.RegisterHub("usb", errmsg) !=  YAPI.SUCCESS:
    sys.exit("RegisterHub error: " + str(errmsg))

if len(sys.argv)<2 : usage()

m = YModule.FindModule(sys.argv[1]) ## use serial or logical name

if m.isOnline():
    if len(sys.argv) > 2:
        if sys.argv[2].upper() == "ON" :  m.set_beacon(YModule.BEACON_ON)
        if sys.argv[2].upper() == "OFF" : m.set_beacon(YModule.BEACON_OFF)

    print("serial:       " + m.get_serialNumber())
    print("logical name: " + m.get_logicalName())
    print("luminosity:   " + str(m.get_luminosity()))
    if m.get_beacon() == YModule.BEACON_ON:
        print("beacon:       ON")
    else:
        print("beacon:       OFF")
    print("upTime:       " + str(m.get_upTime()/1000)+" sec")
```

```
    print("USB current:  " + str(m.get_usbCurrent())+" mA")
    print("logs:\n" + m.get_lastLogs())
else:
    print(sys.argv[1] + " not connected (check identification and USB cable)")
```

Each property `xxx` of the module can be read thanks to a method of type `YModule.get_xxxx()`, and properties which are not read-only can be modified with the help of the `YModule.set_xxx()` method. For more details regarding the used functions, refer to the API chapters.

Changing the module settings

When you want to modify the settings of a module, you only need to call the corresponding `YModule.set_xxx()` function. However, this modification is performed only in the random access memory (RAM) of the module: if the module is restarted, the modifications are lost. To memorize them persistently, it is necessary to ask the module to save its current configuration in its permanent memory. To do so, use the `YModule.saveToFlash()` method. Inversely, it is possible to force the module to forget its current settings by using the `YModule.revertFromFlash()` method. The short example below allows you to modify the logical name of a module.

```
#!/usr/bin/python
# -*- coding: utf-8 -*-
import os,sys
from yocto_api import *

def usage():
    sys.exit("usage: demo <serial or logical name> <new logical name>")

if len(sys.argv) != 3 :  usage()

errmsg =YRefParam()
if YAPI.RegisterHub("usb", errmsg) !=  YAPI.SUCCESS:
    sys.exit("RegisterHub error: " + str(errmsg))

m = YModule.FindModule(sys.argv[1]) # use serial or logical name

if m.isOnline():
    newname = sys.argv[2]
    if not YAPI.CheckLogicalName(newname):
        sys.exit("Invalid name (" + newname + ")")
    m.set_logicalName(newname)
    m.saveToFlash()  # do not forget this
    print ("Module: serial= " + m.get_serialNumber()+" / name= " + m.get_logicalName())
else:
    sys.exit("not connected (check identification and USB cable")
```

Warning: the number of write cycles of the nonvolatile memory of the module is limited. When this limit is reached, nothing guaranties that the saving process is performed correctly. This limit, linked to the technology employed by the module micro-processor, is located at about 100000 cycles. In short, you can use the `YModule.saveToFlash()` function only 100000 times in the life of the module. Make sure you do not call this function within a loop.

Listing the modules

Obtaining the list of the connected modules is performed with the `YModule.yFirstModule()` function which returns the first module found. Then, you only need to call the `nextModule()` function of this object to find the following modules, and this as long as the returned value is not `null`. Below a short example listing the connected modules.

```
#!/usr/bin/python
# -*- coding: utf-8 -*-
import os,sys

from yocto_api import *

errmsg=YRefParam()
```

```
# Setup the API to use local USB devices
if YAPI.RegisterHub("usb", errmsg)!= YAPI.SUCCESS:
    sys.exit("init error"+str(errmsg))

print('Device list')

module = YModule.FirstModule()
while module is not None:
     print(module.get_serialNumber()+' ('+module.get_productName()+')')
     module = module.nextModule()
```

15.5. Error handling

When you implement a program which must interact with USB modules, you cannot disregard error handling. Inevitably, there will be a time when a user will have unplugged the device, either before running the software, or even while the software is running. The Yoctopuce library is designed to help you support this kind of behavior, but your code must nevertheless be conceived to interpret in the best possible way the errors indicated by the library.

The simplest way to work around the problem is the one used in the short examples provided in this chapter: before accessing a module, check that it is online with the `isOnline` function, and then hope that it will stay so during the fraction of a second necessary for the following code lines to run. This method is not perfect, but it can be sufficient in some cases. You must however be aware that you cannot completely exclude an error which would occur after the call to `isOnline` and which could crash the software. The only way to prevent this is to implement one of the two error handling techniques described below.

The method recommended by most programming languages for unpredictable error handling is the use of exceptions. By default, it is the behavior of the Yoctopuce library. If an error happens while you try to access a module, the library throws an exception. In this case, there are three possibilities:

- If your code catches the exception and handles it, everything goes well.
- If your program is running in debug mode, you can relatively easily determine where the problem happened and view the explanatory message linked to the exception.
- Otherwise... the exception makes your program crash, bang!

As this latest situation is not the most desirable, the Yoctopuce library offers another possibility for error handling, allowing you to create a robust program without needing to catch exceptions at every line of code. You simply need to call the `yDisableExceptions()` function to commute the library to a mode where exceptions for all the functions are systematically replaced by specific return values, which can be tested by the caller when necessary. For each function, the name of each return value in case of error is systematically documented in the library reference. The name always follows the same logic: a `get_state()` method returns a `Y_STATE_INVALID` value, a `get_currentValue` method returns a `Y_CURRENTVALUE_INVALID` value, and so on. In any case, the returned value is of the expected type and is not a null pointer which would risk crashing your program. At worst, if you display the value without testing it, it will be outside the expected bounds for the returned value. In the case of functions which do not normally return information, the return value is `YAPI_SUCCESS` if everything went well, and a different error code in case of failure.

When you work without exceptions, you can obtain an error code and an error message explaining the source of the error. You can request them from the object which returned the error, calling the `errType()` and `errMessage()` methods. Their returned values contain the same information as in the exceptions when they are active.

16. Using the Yocto-Relay with Java

Java is an object oriented language created by Sun Microsystem. Beside being free, its main strength is its portability. Unfortunately, this portability has an excruciating price. In Java, hardware abstraction is so high that it is almost impossible to work directly with the hardware. Therefore, the Yoctopuce API does not support native mode in regular Java. The Java API needs a Virtual Hub to communicate with Yoctopuce devices.

16.1. Getting ready

Go to the Yoctopuce web site and download the following items:

- The Java programming library[1]
- The VirtualHub software[2] for Windows, Mac OS X or Linux, depending on your OS

The library is available as source files as well as a *jar* file. Decompress the library files in a folder of your choice, connect your modules, run the VirtualHub software, and you are ready to start your first tests. You do not need to install any driver.

In order to keep them simple, all the examples provided in this documentation are console applications. Naturally, the libraries function in a strictly identical manner if you integrate them in an application with a graphical interface.

16.2. Control of the Relay function

A few lines of code are enough to use a Yocto-Relay. Here is the skeleton of a Java code snippet to use the Relay function.

```
[...]

// Get access to your device, connected locally on USB for instance
YAPI.RegisterHub("127.0.0.1");
relay = YRelay.FindRelay("RELAYLO1-123456.relay1");

// Hot-plug is easy: just check that the device is online
if (relay.isOnline())
   { //Use relay.set_state()
     ...
   }
```

[1] www.yoctopuce.com/EN/libraries.php
[2] www.yoctopuce.com/EN/virtualhub.php

```
[...]
```

Let us look at these lines in more details.

YAPI.RegisterHub

The `yAPI.RegisterHub` function initializes the Yoctopuce API and indicates where the modules should be looked for. The parameter is the address of the Virtual Hub able to see the devices. If the initialization does not succeed, an exception is thrown.

YRelay.FindRelay

The `YRelay.FindRelay` function allows you to find a relay from the serial number of the module on which it resides and from its function name. You can use logical names as well, as long as you have initialized them. Let us imagine a Yocto-Relay module with serial number *RELAYLO1-123456* which you have named "*MyModule*", and for which you have given the *relay1* function the name "*MyFunction*". The following five calls are strictly equivalent, as long as "*MyFunction*" is defined only once.

```
relay = YRelay.FindRelay("RELAYLO1-123456.relay1")
relay = YRelay.FindRelay("RELAYLO1-123456.MyFunction")
relay = YRelay.FindRelay("MyModule.relay1")
relay = YRelay.FindRelay("MyModule.MyFunction")
relay = YRelay.FindRelay("MyFunction")
```

`YRelay.FindRelay` returns an object which you can then use at will to control the relay.

isOnline

The `isOnline()` method of the object returned by `YRelay.FindRelay` allows you to know if the corresponding module is present and in working order.

set_state

The `set_state()` method of the objet returned by `YRelay.FindRelay` switches the relay position to one of its two outputs. The two possible parameter values are `YRelay.STATE_A` for output A, and `YRelay.STATE_B` for output B.

A real example

Launch you Java environment and open the corresponding sample project provided in the directory **Examples/Doc-GettingStarted-Yocto-Relay** of the Yoctopuce library.

In this example, you will recognize the functions explained above, but this time used with all the side materials needed to make it work nicely as a small demo.

```
import com.yoctopuce.YoctoAPI.*;

public class Demo {

    public static void main(String[] args)   {
        try {
            // setup the API to use local VirtualHub
            YAPI.RegisterHub("127.0.0.1");
        } catch (YAPI_Exception ex) {
            System.out.println("Cannot contact VirtualHub on 127.0.0.1 (" +
ex.getLocalizedMessage() + ")");
            System.out.println("Ensure that the VirtualHub application is running");
            System.exit(1);
        }

        YRelay relay;
        if (args.length > 0) {
            relay = YRelay.FindRelay(args[0]);
        } else {
            relay = YRelay.FirstRelay();
            if (relay == null) {
                System.out.println("No module connected (check USB cable)");
```

```
                System.exit(1);
            }
        }

        try {
            System.out.println("Switch relay to B");
            relay.set_state(YRelay.STATE_B);
            YAPI.Sleep(1000);
            System.out.println("Switch relay to A");
            relay.set_state(YRelay.STATE_A);
        } catch (YAPI_Exception ex) {
            System.out.println("Module "+relay.describe()+" not connected (check
identification and USB cable)");
        }

        YAPI.FreeAPI();
    }
}
```

16.3. Control of the module part

Each module can be controlled in a similar manner, you can find below a simple sample program displaying the main parameters of the module and enabling you to activate the localization beacon.

```
import com.yoctopuce.YoctoAPI.*;
import java.util.logging.Level;
import java.util.logging.Logger;

public class Demo {

    public static void main(String[] args)
    {
        try {
            // setup the API to use local VirtualHub
            YAPI.RegisterHub("127.0.0.1");
        } catch (YAPI_Exception ex) {
            System.out.println("Cannot contact VirtualHub on 127.0.0.1 (" +
ex.getLocalizedMessage() + ")");
            System.out.println("Ensure that the VirtualHub application is running");
            System.exit(1);
        }
        System.out.println("usage: demo [serial or logical name] [ON/OFF]");

        YModule module;
        if (args.length == 0) {
            module = YModule.FirstModule();
            if (module == null) {
                System.out.println("No module connected (check USB cable)");
                System.exit(1);
            }
        } else {
            module = YModule.FindModule(args[0]);  // use serial or logical name
        }

        try {
            if (args.length > 1) {
                if (args[1].equalsIgnoreCase("ON")) {
                    module.setBeacon(YModule.BEACON_ON);
                } else {
                    module.setBeacon(YModule.BEACON_OFF);
                }
            }
            System.out.println("serial:       " + module.get_serialNumber());
            System.out.println("logical name: " + module.get_logicalName());
            System.out.println("luminosity:   " + module.get_luminosity());
            if (module.get_beacon() == YModule.BEACON_ON) {
                System.out.println("beacon:       ON");
            } else {
                System.out.println("beacon:       OFF");
            }
            System.out.println("upTime:       " + module.get_upTime() / 1000 + " sec");
            System.out.println("USB current:  " + module.get_usbCurrent() + " mA");
```

```
            System.out.println("logs:\n" + module.get_lastLogs());
        } catch (YAPI_Exception ex) {
            System.out.println(args[1] + " not connected (check identification and USB
cable)");
        }
        YAPI.FreeAPI();
    }
}
```

Each property `xxx` of the module can be read thanks to a method of type `YModule.get_xxxx()`, and properties which are not read-only can be modified with the help of the `YModule.set_xxx()` method. For more details regarding the used functions, refer to the API chapters.

Changing the module settings

When you want to modify the settings of a module, you only need to call the corresponding `YModule.set_xxx()` function. However, this modification is performed only in the random access memory (RAM) of the module: if the module is restarted, the modifications are lost. To memorize them persistently, it is necessary to ask the module to save its current configuration in its permanent memory. To do so, use the `YModule.saveToFlash()` method. Inversely, it is possible to force the module to forget its current settings by using the `YModule.revertFromFlash()` method. The short example below allows you to modify the logical name of a module.

```
import com.yoctopuce.YoctoAPI.*;

public class Demo {

    public static void main(String[] args)
    {
        try {
            // setup the API to use local VirtualHub
            YAPI.RegisterHub("127.0.0.1");
        } catch (YAPI_Exception ex) {
            System.out.println("Cannot contact VirtualHub on 127.0.0.1 (" +
ex.getLocalizedMessage() + ")");
            System.out.println("Ensure that the VirtualHub application is running");
            System.exit(1);
        }

        if (args.length != 2) {
            System.out.println("usage: demo <serial or logical name> <new logical name>");
            System.exit(1);
        }

        YModule m;
        String newname;

        m = YModule.FindModule(args[0]); // use serial or logical name

        try {
            newname = args[1];
            if (!YAPI.CheckLogicalName(newname))
                {
                    System.out.println("Invalid name (" + newname + ")");
                    System.exit(1);
                }

            m.set_logicalName(newname);
            m.saveToFlash(); // do not forget this

            System.out.println("Module: serial= " + m.get_serialNumber());
            System.out.println(" / name= " + m.get_logicalName());
        } catch (YAPI_Exception ex) {
            System.out.println("Module " + args[0] + "not connected (check identification
and USB cable)");
            System.out.println(ex.getMessage());
            System.exit(1);
        }

        YAPI.FreeAPI();
    }
}
```

Warning: the number of write cycles of the nonvolatile memory of the module is limited. When this limit is reached, nothing guaranties that the saving process is performed correctly. This limit, linked to the technology employed by the module micro-processor, is located at about 100000 cycles. In short, you can use the `YModule.saveToFlash()` function only 100000 times in the life of the module. Make sure you do not call this function within a loop.

Listing the modules

Obtaining the list of the connected modules is performed with the `YModule.yFirstModule()` function which returns the first module found. Then, you only need to call the `nextModule()` function of this object to find the following modules, and this as long as the returned value is not `null`. Below a short example listing the connected modules.

```
import com.yoctopuce.YoctoAPI.*;

public class Demo {

    public static void main(String[] args)
    {
        try {
            // setup the API to use local VirtualHub
            YAPI.RegisterHub("127.0.0.1");
        } catch (YAPI_Exception ex) {
            System.out.println("Cannot contact VirtualHub on 127.0.0.1 (" +
ex.getLocalizedMessage() + ")");
            System.out.println("Ensure that the VirtualHub application is running");
            System.exit(1);
        }

        System.out.println("Device list");
        YModule module = YModule.FirstModule();
        while (module != null) {
            try {
                System.out.println(module.get_serialNumber() + " (" +
module.get_productName() + ")");
            } catch (YAPI_Exception ex) {
                break;
            }
            module = module.nextModule();
        }

        YAPI.FreeAPI();
    }
}
```

16.4. Error handling

When you implement a program which must interact with USB modules, you cannot disregard error handling. Inevitably, there will be a time when a user will have unplugged the device, either before running the software, or even while the software is running. The Yoctopuce library is designed to help you support this kind of behavior, but your code must nevertheless be conceived to interpret in the best possible way the errors indicated by the library.

The simplest way to work around the problem is the one used in the short examples provided in this chapter: before accessing a module, check that it is online with the `isOnline` function, and then hope that it will stay so during the fraction of a second necessary for the following code lines to run. This method is not perfect, but it can be sufficient in some cases. You must however be aware that you cannot completely exclude an error which would occur after the call to `isOnline` and which could crash the software.

In the Java API, error handling is implemented with exceptions. Therefore you must catch and handle correctly all exceptions that might be thrown by the API if you do not want your software to crash as soon as you unplug a device.

17. Using the Yocto-Relay with Android

To tell the truth, Android is not a programming language, it is an operating system developed by Google for mobile appliances such as smart phones and tablets. But it so happens that under Android everything is programmed with the same programming language: Java. Nevertheless, the programming paradigms and the possibilities to access the hardware are slightly different from classical Java, and this justifies a separate chapter on Android programming.

17.1. Native access and VirtualHub

In the opposite to the classical Java API, the Java for Android API can access USB modules natively. However, as there is no VirtualHub running under Android, it is not possible to remotely control Yoctopuce modules connected to a machine under Android. Naturally, the Java for Android API remains perfectly able to connect itself to a VirtualHub running on another OS.

17.2. Getting ready

Go to the Yoctopuce web site and download the Java for Android programming library[1]. The library is available as source files, and also as a jar file. Connect your modules, decompress the library files in the directory of your choice, and configure your Android programming environment so that it can find them.

To keep them simple, all the examples provided in this documentation are snippets of Android applications. You must integrate them in your own Android applications to make them work. However, your can find complete applications in the examples provided with the Java for Android library.

17.3. Compatibility

In an ideal world, you would only need to have a smart phone running under Android to be able to make Yoctopuce modules work. Unfortunately, it is not quite so in the real world. A machine running under Android must fulfil to a few requirements to be able to manage Yoctopuce USB modules natively.

[1] www.yoctopuce.com/EN/libraries.php

Android 4.x

Android 4.0 (api 14) and following are officially supported. Theoretically, support of USB *host* functions since Android 3.1. But be aware that the Yoctopuce Java for Android API is regularly tested only from Android 4 onwards.

USB *host* support

Naturally, not only must your machine have a USB port, this port must also be able to run in *host* mode. In *host* mode, the machine literally takes control of the devices which are connected to it. The USB ports of a desktop computer, for example, work in *host* mode. The opposite of the *host* mode is the *device* mode. USB keys, for instance, work in *device* mode: they must be controlled by a *host*. Some USB ports are able to work in both modes, they are *OTG* (*On The Go*) ports. It so happens that many mobile devices can only work in *device* mode: they are designed to be connected to a charger or a desktop computer, and nothing else. It is therefore highly recommended to pay careful attention to the technical specifications of a product working under Android before hoping to make Yoctopuce modules work with it.

Unfortunately, having a correct version of Android and USB ports working in *host* mode is not enough to guaranty that Yoctopuce modules will work well under Android. Indeed, some manufacturers configure their Android image so that devices other than keyboard and mass storage are ignored, and this configuration is hard to detect. As things currently stand, the best way to know if a given Android machine works with Yoctopuce modules consists in trying.

Supported hardware

The library is tested and validated on the following machines:

- Samsung Galaxy S3
- Samsung Galaxy Note 2
- Google Nexus 5
- Google Nexus 7
- Acer Iconia Tab A200
- Asus Tranformer Pad TF300T
- Kurio 7

If your Android machine is not able to control Yoctopuce modules natively, you still have the possibility to remotely control modules driven by a VirtualHub on another OS, or a YoctoHub [2].

17.4. Activating the USB port under Android

By default, Android does not allow an application to access the devices connected to the USB port. To enable your application to interact with a Yoctopuce module directly connected on your tablet on a USB port, a few additional steps are required. If you intend to interact only with modules connected on another machine through the network, you can ignore this section.

In your `AndroidManifest.xml`, you must declare using the "USB Host" functionality by adding the `<uses-feature android:name="android.hardware.usb.host" />` tag in the `manifest` section.

```
<manifest ...>
    ...
    <uses-feature android:name="android.hardware.usb.host" />;
    ...
</manifest>
```

When first accessing a Yoctopuce module, Android opens a window to inform the user that the application is going to access the connected module. The user can deny or authorize access to the device. If the user authorizes the access, the application can access the connected device as long as

[2] Yoctohubs are a plug and play way to add network connectivity to your Yoctopuce devices. more info on http://www.yoctopuce.com/EN/products/category/extensions-and-networking

it stays connected. To enable the Yoctopuce library to correctly manage these authorizations, your must provide a pointer on the application context by calling the EnableUSBHost method of the YAPI class before the first USB access. This function takes as arguments an object of the `android.content.Context` class (or of a subclass). As the Activity class is a subclass of `Context`, it is simpler to call `YAPI.EnableUSBHost(this);` in the method `onCreate` of your application. If the object passed as parameter is not of the correct type, a `YAPI_Exception` exception is generated.

```
...
@Override
public void onCreate(Bundle savedInstanceState) {
    super.onCreate(savedInstanceState);
    try {
                // Pass the application Context to the Yoctopuce Library
        YAPI.EnableUSBHost(this);
        } catch (YAPI_Exception e) {
                Log.e("Yocto",e.getLocalizedMessage());
        }
}
...
```

Autorun

It is possible to register your application as a default application for a USB module. In this case, as soon as a module is connected to the system, the application is automatically launched. You must add *<action android:name="android.hardware.usb.action.USB_DEVICE_ATTACHED"/>* in the section *<intent-filter>* of the main activity. The section *<activity>* must have a pointer to an XML file containing the list of USB modules which can run the application.

```
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
    ...
    <uses-feature android:name="android.hardware.usb.host" />
    ...
    <application ... >
        <activity
            android:name=".MainActivity" >
            <intent-filter>
                <action android:name="android.intent.action.MAIN" />
                <action android:name="android.hardware.usb.action.USB_DEVICE_ATTACHED" />
                <category android:name="android.intent.category.LAUNCHER" />
            </intent-filter>

            <meta-data
                android:name="android.hardware.usb.action.USB_DEVICE_ATTACHED"
                android:resource="@xml/device_filter" />
        </activity>
    </application>

</manifest>
```

The XML file containing the list of modules allowed to run the application must be saved in the res/xml directory. This file contains a list of USB *vendorId* and *deviceID* in decimal. The following example runs the application as soon as a Yocto-Relay or a YoctoPowerRelay is connected. You can find the vendorID and the deviceID of Yoctopuce modules in the characteristics section of the documentation.

```
<?xml version="1.0" encoding="utf-8"?>

<resources>
    <usb-device vendor-id="9440" product-id="12" />
    <usb-device vendor-id="9440" product-id="13" />
</resources>
```

17.5. Control of the Relay function

A few lines of code are enough to use a Yocto-Relay. Here is the skeleton of a Java code snippet to use the Relay function.

```
[...]

// Retrieving the object representing the module (connected here locally by USB)
YAPI.EnableUSBHost(this);
YAPI.RegisterHub("usb");
relay = YRelay.FindRelay("RELAYLO1-123456.relay1");

// Hot-plug is easy: just check that the device is online
if (relay.isOnline())
   { //Use relay.set_state()
     ...
   }

[...]
```

Let us look at these lines in more details.

YAPI.EnableUSBHost

The `YAPI.EnableUSBHost` function initializes the API with the Context of the current application. This function takes as argument an object of the `android.content.Context` class (or of a subclass). If you intend to connect your application only to other machines through the network, this function is facultative.

YAPI.RegisterHub

The `yAPI.RegisterHub` function initializes the Yoctopuce API and indicates where the modules should be looked for. The parameter is the address of the virtual hub able to see the devices. If the string "usb" is passed as parameter, the API works with modules locally connected to the machine. If the initialization does not succeed, an exception is thrown.

YRelay.FindRelay

The `YRelay.FindRelay` function allows you to find a relay from the serial number of the module on which it resides and from its function name. You can use logical names as well, as long as you have initialized them. Let us imagine a Yocto-Relay module with serial number *RELAYLO1-123456* which you have named "*MyModule*", and for which you have given the *relay1* function the name "*MyFunction*". The following five calls are strictly equivalent, as long as "*MyFunction*" is defined only once.

```
relay = YRelay.FindRelay("RELAYLO1-123456.relay1")
relay = YRelay.FindRelay("RELAYLO1-123456.MyFunction")
relay = YRelay.FindRelay("MyModule.relay1")
relay = YRelay.FindRelay("MyModule.MyFunction")
relay = YRelay.FindRelay("MyFunction")
```

`YRelay.FindRelay` returns an object which you can then use at will to control the relay.

isOnline

The `isOnline()` method of the object returned by `YRelay.FindRelay` allows you to know if the corresponding module is present and in working order.

set_state

The `set_state()` method of the objet returned by `YRelay.FindRelay` switches the relay position to one of its two outputs. The two possible parameter values are `YRelay.STATE_A` for output A, and `YRelay.STATE_B` for output B.

A real example

Launch you Java environment and open the corresponding sample project provided in the directory **Examples//Doc-Examples** of the Yoctopuce library.

In this example, you can recognize the functions explained above, but this time used with all the side materials needed to make it work nicely as a small demo.

```
package com.yoctopuce.doc_examples;

import android.app.Activity;
import android.os.Bundle;
import android.view.View;
import android.widget.AdapterView;
import android.widget.AdapterView.OnItemSelectedListener;
import android.widget.ArrayAdapter;
import android.widget.Spinner;

import com.yoctopuce.YoctoAPI.YAPI;
import com.yoctopuce.YoctoAPI.YAPI_Exception;
import com.yoctopuce.YoctoAPI.YRelay;

public class GettingStarted_Yocto_Relay extends Activity implements OnItemSelectedListener
{

    private YRelay relay = null;
    private ArrayAdapter<String> aa;

    @Override
    public void onCreate(Bundle savedInstanceState)
    {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.gettingstarted_yocto_relay);
        Spinner my_spin = (Spinner) findViewById(R.id.spinner1);
        my_spin.setOnItemSelectedListener(this);
        aa = new ArrayAdapter<String>(this, android.R.layout.simple_spinner_item);
        aa.setDropDownViewResource(android.R.layout.simple_spinner_dropdown_item);
        my_spin.setAdapter(aa);
    }

    @Override
    protected void onStart()
    {
        super.onStart();

        try {
            aa.clear();
            YAPI.EnableUSBHost(this);
            YAPI.RegisterHub("usb");
            YRelay r = YRelay.FirstRelay();
            while (r != null) {
                String hwid = r.get_hardwareId();
                aa.add(hwid);
                r = r.nextRelay();
            }
        } catch (YAPI_Exception e) {
            e.printStackTrace();
        }
        // refresh Spinner with detected relay
        aa.notifyDataSetChanged();
    }

    @Override
    protected void onStop()
    {
        super.onStop();
        YAPI.FreeAPI();
    }

    @Override
    public void onItemSelected(AdapterView<?> parent, View view, int pos, long id)
    {
        String hwid = parent.getItemAtPosition(pos).toString();
        relay = YRelay.FindRelay(hwid);
    }
```

```
    @Override
    public void onNothingSelected(AdapterView<?> arg0)
    {
    }

    /** Called when the user touches the button State A */
    public void setStateA(View view)
    {
        // Do something in response to button click
        if (relay != null)
            try {
                relay.setState(YRelay.STATE_A);
            } catch (YAPI_Exception e) {
                e.printStackTrace();
            }
    }

    /** Called when the user touches the button State B */
    public void setStateB(View view)
    {
        // Do something in response to button click
        if (relay != null)
            try {
                relay.setState(YRelay.STATE_B);
            } catch (YAPI_Exception e) {
                e.printStackTrace();
            }
    }

}
```

17.6. Control of the module part

Each module can be controlled in a similar manner, you can find below a simple sample program displaying the main parameters of the module and enabling you to activate the localization beacon.

```
package com.yoctopuce.doc_examples;

import android.app.Activity;
import android.os.Bundle;
import android.util.Log;
import android.view.View;
import android.widget.AdapterView;
import android.widget.AdapterView.OnItemSelectedListener;
import android.widget.ArrayAdapter;
import android.widget.Spinner;
import android.widget.Switch;
import android.widget.TextView;

import com.yoctopuce.YoctoAPI.YAPI;
import com.yoctopuce.YoctoAPI.YAPI_Exception;
import com.yoctopuce.YoctoAPI.YModule;

public class ModuleControl extends Activity implements OnItemSelectedListener
{

    private ArrayAdapter<String> aa;
    private YModule module = null;

    @Override
    public void onCreate(Bundle savedInstanceState)
    {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.modulecontrol);
        Spinner my_spin = (Spinner) findViewById(R.id.spinner1);
        my_spin.setOnItemSelectedListener(this);
        aa = new ArrayAdapter<String>(this, android.R.layout.simple_spinner_item);
        aa.setDropDownViewResource(android.R.layout.simple_spinner_dropdown_item);
        my_spin.setAdapter(aa);
    }

    @Override
    protected void onStart()
```

```
{
    super.onStart();

    try {
        aa.clear();
        YAPI.EnableUSBHost(this);
        YAPI.RegisterHub("usb");
        YModule r = YModule.FirstModule();
        while (r != null) {
            String hwid = r.get_hardwareId();
            aa.add(hwid);
            r = r.nextModule();
        }
    } catch (YAPI_Exception e) {
        e.printStackTrace();
    }
    // refresh Spinner with detected relay
    aa.notifyDataSetChanged();
}

@Override
protected void onStop()
{
    super.onStop();
    YAPI.FreeAPI();
}

private void DisplayModuleInfo()
{
    TextView field;
    if (module == null)
        return;
    try {
        field = (TextView) findViewById(R.id.serialfield);
        field.setText(module.getSerialNumber());
        field = (TextView) findViewById(R.id.logicalnamefield);
        field.setText(module.getLogicalName());
        field = (TextView) findViewById(R.id.luminosityfield);
        field.setText(String.format("%d%%", module.getLuminosity()));
        field = (TextView) findViewById(R.id.uptimefield);
        field.setText(module.getUpTime() / 1000 + " sec");
        field = (TextView) findViewById(R.id.usbcurrentfield);
        field.setText(module.getUsbCurrent() + " mA");
        Switch sw = (Switch) findViewById(R.id.beaconswitch);
        Log.d("switch", "beacon" + module.get_beacon());
        sw.setChecked(module.getBeacon() == YModule.BEACON_ON);
        field = (TextView) findViewById(R.id.logs);
        field.setText(module.get_lastLogs());

    } catch (YAPI_Exception e) {
        e.printStackTrace();
    }
}

@Override
public void onItemSelected(AdapterView<?> parent, View view, int pos, long id)
{
    String hwid = parent.getItemAtPosition(pos).toString();
    module = YModule.FindModule(hwid);
    DisplayModuleInfo();
}

@Override
public void onNothingSelected(AdapterView<?> arg0)
{
}

public void refreshInfo(View view)
{
    DisplayModuleInfo();
}

public void toggleBeacon(View view)
{
    if (module == null)
        return;
    boolean on = ((Switch) view).isChecked();
```

```
        try {
            if (on) {
                module.setBeacon(YModule.BEACON_ON);
            } else {
                module.setBeacon(YModule.BEACON_OFF);
            }
        } catch (YAPI_Exception e) {
            e.printStackTrace();
        }
    }
}
```

Each property `xxx` of the module can be read thanks to a method of type `YModule.get_xxxx()`, and properties which are not read-only can be modified with the help of the `YModule.set_xxx()` method. For more details regarding the used functions, refer to the API chapters.

Changing the module settings

When you want to modify the settings of a module, you only need to call the corresponding `YModule.set_xxx()` function. However, this modification is performed only in the random access memory (RAM) of the module: if the module is restarted, the modifications are lost. To memorize them persistently, it is necessary to ask the module to save its current configuration in its permanent memory. To do so, use the `YModule.saveToFlash()` method. Inversely, it is possible to force the module to forget its current settings by using the `YModule.revertFromFlash()` method. The short example below allows you to modify the logical name of a module.

```
package com.yoctopuce.doc_examples;

import android.app.Activity;
import android.os.Bundle;
import android.view.View;
import android.widget.AdapterView;
import android.widget.AdapterView.OnItemSelectedListener;
import android.widget.ArrayAdapter;
import android.widget.EditText;
import android.widget.Spinner;
import android.widget.TextView;
import android.widget.Toast;

import com.yoctopuce.YoctoAPI.YAPI;
import com.yoctopuce.YoctoAPI.YAPI_Exception;
import com.yoctopuce.YoctoAPI.YModule;

public class SaveSettings extends Activity implements OnItemSelectedListener
{

    private ArrayAdapter<String> aa;
    private YModule module = null;

    @Override
    public void onCreate(Bundle savedInstanceState)
    {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.savesettings);
        Spinner my_spin = (Spinner) findViewById(R.id.spinner1);
        my_spin.setOnItemSelectedListener(this);
        aa = new ArrayAdapter<String>(this, android.R.layout.simple_spinner_item);
        aa.setDropDownViewResource(android.R.layout.simple_spinner_dropdown_item);
        my_spin.setAdapter(aa);
    }

    @Override
    protected void onStart()
    {
        super.onStart();

        try {
            aa.clear();
            YAPI.EnableUSBHost(this);
            YAPI.RegisterHub("usb");
            YModule r = YModule.FirstModule();
            while (r != null) {
                String hwid = r.get_hardwareId();
                aa.add(hwid);
```

```
                r = r.nextModule();
            }
        } catch (YAPI_Exception e) {
            e.printStackTrace();
        }
        // refresh Spinner with detected relay
        aa.notifyDataSetChanged();
    }

    @Override
    protected void onStop()
    {
        super.onStop();
        YAPI.FreeAPI();
    }

    private void DisplayModuleInfo()
    {
        TextView field;
        if (module == null)
            return;
        try {
            YAPI.UpdateDeviceList();// fixme
            field = (TextView) findViewById(R.id.logicalnamefield);
            field.setText(module.getLogicalName());
        } catch (YAPI_Exception e) {
            e.printStackTrace();
        }
    }

    @Override
    public void onItemSelected(AdapterView<?> parent, View view, int pos, long id)
    {
        String hwid = parent.getItemAtPosition(pos).toString();
        module = YModule.FindModule(hwid);
        DisplayModuleInfo();
    }

    @Override
    public void onNothingSelected(AdapterView<?> arg0)
    {
    }

    public void saveName(View view)
    {
        if (module == null)
            return;

        EditText edit = (EditText) findViewById(R.id.newname);
        String newname = edit.getText().toString();
        try {
            if (!YAPI.CheckLogicalName(newname)) {
                Toast.makeText(getApplicationContext(), "Invalid name (" + newname + ")",
Toast.LENGTH_LONG).show();
                return;
            }
            module.set_logicalName(newname);
            module.saveToFlash(); // do not forget this
            edit.setText("");
        } catch (YAPI_Exception ex) {
            ex.printStackTrace();
        }
        DisplayModuleInfo();
    }

}
```

Warning: the number of write cycles of the nonvolatile memory of the module is limited. When this limit is reached, nothing guaranties that the saving process is performed correctly. This limit, linked to the technology employed by the module micro-processor, is located at about 100000 cycles. In short, you can use the `YModule.saveToFlash()` function only 100000 times in the life of the module. Make sure you do not call this function within a loop.

Listing the modules

Obtaining the list of the connected modules is performed with the `YModule.yFirstModule()` function which returns the first module found. Then, you only need to call the `nextModule()` function of this object to find the following modules, and this as long as the returned value is not `null`. Below a short example listing the connected modules.

```
package com.yoctopuce.doc_examples;

import android.app.Activity;
import android.os.Bundle;
import android.view.View;
import android.widget.LinearLayout;
import android.widget.TextView;

import com.yoctopuce.YoctoAPI.YAPI;
import com.yoctopuce.YoctoAPI.YAPI_Exception;
import com.yoctopuce.YoctoAPI.YModule;

public class Inventory extends Activity
{

    @Override
    public void onCreate(Bundle savedInstanceState)
    {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.inventory);
    }

    public void refreshInventory(View view)
    {
        LinearLayout layout = (LinearLayout) findViewById(R.id.inventoryList);
        layout.removeAllViews();

        try {
            YAPI.UpdateDeviceList();
            YModule module = YModule.FirstModule();
            while (module != null) {
                String line = module.get_serialNumber() + " (" + module.get_productName() +
")";
                TextView tx = new TextView(this);
                tx.setText(line);
                layout.addView(tx);
                module = module.nextModule();
            }
        } catch (YAPI_Exception e) {
            e.printStackTrace();
        }
    }

    @Override
    protected void onStart()
    {
        super.onStart();
        try {
            YAPI.EnableUSBHost(this);
            YAPI.RegisterHub("usb");
        } catch (YAPI_Exception e) {
            e.printStackTrace();
        }
        refreshInventory(null);
    }

    @Override
    protected void onStop()
    {
        super.onStop();
        YAPI.FreeAPI();
    }

}
```

17.7. Error handling

When you implement a program which must interact with USB modules, you cannot disregard error handling. Inevitably, there will be a time when a user will have unplugged the device, either before running the software, or even while the software is running. The Yoctopuce library is designed to help you support this kind of behavior, but your code must nevertheless be conceived to interpret in the best possible way the errors indicated by the library.

The simplest way to work around the problem is the one used in the short examples provided in this chapter: before accessing a module, check that it is online with the `isOnline` function, and then hope that it will stay so during the fraction of a second necessary for the following code lines to run. This method is not perfect, but it can be sufficient in some cases. You must however be aware that you cannot completely exclude an error which would occur after the call to `isOnline` and which could crash the software.

In the Java API for Android, error handling is implemented with exceptions. Therefore you must catch and handle correctly all exceptions that might be thrown by the API if you do not want your software to crash soon as you unplug a device.

18. Advanced programming

The preceding chapters have introduced, in each available language, the basic programming functions which can be used with your Yocto-Relay module. This chapter presents in a more generic manner a more advanced use of your module. Examples are provided in the language which is the most popular among Yoctopuce customers, that is C#. Nevertheless, you can find complete examples illustrating the concepts presented here in the programming libraries of each language.

To remain as concise as possible, examples provided in this chapter do not perform any error handling. Do not copy them "as is" in a production application.

18.1. Event programming

The methods to manage Yoctopuce modules which we presented to you in preceding chapters were polling functions, consisting in permanently asking the API if something had changed. While easy to understand, this programming technique is not the most efficient, nor the most reactive. Therefore, the Yoctopuce programming API also provides an event programming model. This technique consists in asking the API to signal by itself the important changes as soon as they are detected. Each time a key parameter is modified, the API calls a callback function which you have defined in advance.

Detecting module arrival and departure

Hot-plug management is important when you work with USB modules because, sooner or later, you will have to connect or disconnect a module when your application is running. The API is designed to manage module unexpected arrival or departure in a transparent way. But your application must take this into account if it wants to avoid pretending to use a disconnected module.

Event programming is particularly useful to detect module connection/disconnection. Indeed, it is simpler to be told of new connections rather than to have to permanently list the connected modules to deduce which ones just arrived and which ones left. To be warned as soon as a module is connected, you need three pieces of code.

The callback

The callback is the function which is called each time a new Yoctopuce module is connected. It takes as parameter the relevant module.

```
 static void deviceArrival(YModule m)
{
  Console.WriteLine("New module  : " + m.get_serialNumber());
}
```

Initialization

You must then tell the API that it must call the callback when a new module is connected.

```
YAPI.RegisterDeviceArrivalCallback(deviceArrival);
```

Note that if modules are already connected when the callback is registered, the callback is called for each of the already connected modules.

Triggering callbacks

A classis issue of callback programming is that these callbacks can be triggered at any time, including at times when the main program is not ready to receive them. This can have undesired side effects, such as dead-locks and other race conditions. Therefore, in the Yoctopuce API, module arrival/departure callbacks are called only when the `UpdateDeviceList()` function is running. You only need to call `UpdateDeviceList()` at regular intervals from a timer or from a specific thread to precisely control when the calls to these callbacks happen:

```
// waiting loop managing callbacks
while (true)
{
    // module arrival / departure callback
    YAPI.UpdateDeviceList(ref errmsg);
    // non active waiting time managing other callbacks
    YAPI.Sleep(500, ref errmsg);
}
```

In a similar way, it is possible to have a callback when a module is disconnected. You can find a complete example implemented in your favorite programming language in the *Examples/Prog-EventBased* directory of the corresponding library.

Be aware that in most programming languages, callbacks must be global procedures, and not methods. If you wish for the callback to call the method of an object, define your callback as a global procedure which then calls your method.

19. High-level API Reference

This chapter summarizes the high-level API functions to drive your Yocto-Relay. Syntax and exact type names may vary from one language to another, but, unless otherwise stated, all the functions are available in every language. For detailed information regarding the types of arguments and return values for a given language, refer to the definition file for this language (`yocto_api.*` as well as the other `yocto_*` files that define the function interfaces).

For languages which support exceptions, all of these functions throw exceptions in case of error by default, rather than returning the documented error value for each function. This is by design, to facilitate debugging. It is however possible to disable the use of exceptions using the `yDisableExceptions()` function, in case you prefer to work with functions that return error values.

This chapter does not repeat the programming concepts described earlier, in order to stay as concise as possible. In case of doubt, do not hesitate to go back to the chapter describing in details all configurable attributes.

19.1. General functions

These general functions should be used to initialize and configure the Yoctopuce library. In most cases, a simple call to function `yRegisterHub()` should be enough. The module-specific functions `yFind...()` or `yFirst...()` should then be used to retrieve an object that provides interaction with the module.

In order to use the functions described here, you should include:

```
js      <script type='text/javascript' src='yocto_api.js'></script>
nodejs  var yoctolib = require('yoctolib');
        var YAPI = yoctolib.YAPI;
        var YModule = yoctolib.YModule;
php     require_once('yocto_api.php');
cpp     #include "yocto_api.h"
m       #import "yocto_api.h"
pas     uses yocto_api;
vb      yocto_api.vb
cs      yocto_api.cs
java    import com.yoctopuce.YoctoAPI.YModule;
py      from yocto_api import *
```

Global functions
yCheckLogicalName(**name**)
Checks if a given string is valid as logical name for a module or a function.
yDisableExceptions()
Disables the use of exceptions to report runtime errors.
yEnableExceptions()
Re-enables the use of exceptions for runtime error handling.
yEnableUSBHost(**osContext**)
This function is used only on Android.
yFreeAPI()
Frees dynamically allocated memory blocks used by the Yoctopuce library.
yGetAPIVersion()
Returns the version identifier for the Yoctopuce library in use.
yGetTickCount()
Returns the current value of a monotone millisecond-based time counter.
yHandleEvents(**errmsg**)
Maintains the device-to-library communication channel.
yInitAPI(**mode**, **errmsg**)
Initializes the Yoctopuce programming library explicitly.
yPreregisterHub(**url**, **errmsg**)
Fault-tolerant alternative to RegisterHub().
yRegisterDeviceArrivalCallback(**arrivalCallback**)
Register a callback function, to be called each time a device is pluged.
yRegisterDeviceRemovalCallback(**removalCallback**)
Register a callback function, to be called each time a device is unpluged.
yRegisterHub(**url**, **errmsg**)
Setup the Yoctopuce library to use modules connected on a given machine.
yRegisterHubDiscoveryCallback(**callback**)

Register a callback function, to be called each time a network hub or a VirtualHub is detected on the local network.

yRegisterLogFunction(**logfun**)

Registers a log callback function.

ySelectArchitecture(**arch**)

Select the architecture or the library to be loaded to access to USB.

ySetDelegate(**object**)

(Objective-C only) Register an object that must follow the procol `YDeviceHotPlug`.

ySetTimeout(**callback**, **ms_timeout**, **arguments**)

Invoke the specified callback function after a given timeout.

ySleep(**ms_duration**, **errmsg**)

Pauses the execution flow for a specified duration.

yUnregisterHub(**url**)

Setup the Yoctopuce library to no more use modules connected on a previously registered machine with RegisterHub.

yUpdateDeviceList(**errmsg**)

Triggers a (re)detection of connected Yoctopuce modules.

yUpdateDeviceList_async(**callback**, **context**)

Triggers a (re)detection of connected Yoctopuce modules.

YAPI.CheckLogicalName() YAPI
yCheckLogicalName()

Checks if a given string is valid as logical name for a module or a function.

```
js      function yCheckLogicalName( name)
nodejs  function CheckLogicalName( name)
php     function yCheckLogicalName( $name)
cpp     bool yCheckLogicalName( const string& name)
m       BOOL yCheckLogicalName( NSString * name)
pas     function yCheckLogicalName( name: string): boolean
vb      function yCheckLogicalName( ByVal name As String) As Boolean
cs      bool CheckLogicalName( string name)
java    boolean CheckLogicalName( String name)
py      def CheckLogicalName( name)
```

A valid logical name has a maximum of 19 characters, all among `A..Z`, `a..z`, `0..9`, `_`, and `-`. If you try to configure a logical name with an incorrect string, the invalid characters are ignored.

Parameters :

name a string containing the name to check.

Returns :

`true` if the name is valid, `false` otherwise.

YAPI.DisableExceptions() YAPI
yDisableExceptions()

Disables the use of exceptions to report runtime errors.

```
js      function yDisableExceptions( )
nodejs  function DisableExceptions( )
php     function yDisableExceptions( )
cpp     void yDisableExceptions( )
m       void yDisableExceptions( )
pas     procedure yDisableExceptions( )
vb      procedure yDisableExceptions( )
cs      void DisableExceptions( )
py      def DisableExceptions( )
```

When exceptions are disabled, every function returns a specific error value which depends on its type and which is documented in this reference manual.

YAPI.EnableExceptions() YAPI
yEnableExceptions()

Re-enables the use of exceptions for runtime error handling.

js	function **yEnableExceptions**( )
nodejs	function **EnableExceptions**( )
php	function **yEnableExceptions**( )
cpp	void **yEnableExceptions**( )
m	void **yEnableExceptions**( )
pas	procedure **yEnableExceptions**( )
vb	procedure **yEnableExceptions**( )
cs	void **EnableExceptions**( )
py	def **EnableExceptions**( )

Be aware than when exceptions are enabled, every function that fails triggers an exception. If the exception is not caught by the user code, it either fires the debugger or aborts (i.e. crash) the program. On failure, throws an exception or returns a negative error code.

YAPI.EnableUSBHost() yEnableUSBHost()

YAPI

This function is used only on Android.

java synchronized static void **EnableUSBHost**(Object **osContext**)

Before calling `yRegisterHub("usb")` you need to activate the USB host port of the system. This function takes as argument, an object of class android.content.Context (or any subclasee). It is not necessary to call this function to reach modules through the network.

Parameters :

osContext an object of class android.content.Context (or any subclass).

YAPI.FreeAPI() YAPI
yFreeAPI()

Frees dynamically allocated memory blocks used by the Yoctopuce library.

js	function **yFreeAPI**( )
nodejs	function **FreeAPI**( )
php	function **yFreeAPI**( )
cpp	void **yFreeAPI**( )
m	void **yFreeAPI**( )
pas	procedure **yFreeAPI**( )
vb	procedure **yFreeAPI**( )
cs	void **FreeAPI**( )
java	synchronized static void **FreeAPI**( )
py	def **FreeAPI**( )

It is generally not required to call this function, unless you want to free all dynamically allocated memory blocks in order to track a memory leak for instance. You should not call any other library function after calling `yFreeAPI()`, or your program will crash.

YAPI.GetAPIVersion() YAPI
yGetAPIVersion()

Returns the version identifier for the Yoctopuce library in use.

```
js      function yGetAPIVersion( )
nodejs  function GetAPIVersion( )
php     function yGetAPIVersion( )
cpp     string yGetAPIVersion( )
m       NSString* yGetAPIVersion( )
pas     function yGetAPIVersion( ): string
vb      function yGetAPIVersion( ) As String
cs      String GetAPIVersion( )
java    String GetAPIVersion( )
py      def GetAPIVersion( )
```

The version is a string in the form `"Major.Minor.Build"`, for instance `"1.01.5535"`. For languages using an external DLL (for instance C#, VisualBasic or Delphi), the character string includes as well the DLL version, for instance `"1.01.5535 (1.01.5439)"`.

If you want to verify in your code that the library version is compatible with the version that you have used during development, verify that the major number is strictly equal and that the minor number is greater or equal. The build number is not relevant with respect to the library compatibility.

Returns :
a character string describing the library version.

YAPI.GetTickCount() YAPI
yGetTickCount()

Returns the current value of a monotone millisecond-based time counter.

js	function **yGetTickCount**( )
nodejs	function **GetTickCount**( )
php	function **yGetTickCount**( )
cpp	u64 **yGetTickCount**( )
m	u64 **yGetTickCount**( )
pas	function **yGetTickCount**( ): u64
vb	function **yGetTickCount**( ) As Long
cs	ulong **GetTickCount**( )
java	long **GetTickCount**( )
py	def **GetTickCount**( )

This counter can be used to compute delays in relation with Yoctopuce devices, which also uses the millisecond as timebase.

Returns :
a long integer corresponding to the millisecond counter.

YAPI.HandleEvents() YAPI
yHandleEvents()

Maintains the device-to-library communication channel.

```
js      function yHandleEvents( errmsg)
nodejs  function HandleEvents( errmsg)
php     function yHandleEvents( &$errmsg)
cpp     YRETCODE yHandleEvents( string& errmsg)
m       YRETCODE yHandleEvents( NSError** errmsg)
pas     function yHandleEvents( var errmsg: string): integer
vb      function yHandleEvents( ByRef errmsg As String) As YRETCODE
cs      YRETCODE HandleEvents( ref string errmsg)
java    int HandleEvents( )
py      def HandleEvents( errmsg=None)
```

If your program includes significant loops, you may want to include a call to this function to make sure that the library takes care of the information pushed by the modules on the communication channels. This is not strictly necessary, but it may improve the reactivity of the library for the following commands.

This function may signal an error in case there is a communication problem while contacting a module.

Parameters :

errmsg a string passed by reference to receive any error message.

Returns :

YAPI_SUCCESS when the call succeeds. On failure, throws an exception or returns a negative error code.

YAPI.InitAPI() YAPI
yInitAPI()

Initializes the Yoctopuce programming library explicitly.

```
js      function yInitAPI( mode, errmsg)
nodejs  function InitAPI( mode, errmsg)
php     function yInitAPI( $mode, &$errmsg)
cpp     YRETCODE yInitAPI( int mode, string& errmsg)
m       YRETCODE yInitAPI( int mode, NSError** errmsg)
pas     function yInitAPI( mode: integer, var errmsg: string): integer
vb      function yInitAPI( ByVal mode As Integer, ByRef errmsg As String) As Integer
cs      int InitAPI( int mode, ref string errmsg)
java    synchronized static int InitAPI( int mode)
py      def InitAPI( mode, errmsg=None)
```

It is not strictly needed to call `yInitAPI()`, as the library is automatically initialized when calling `yRegisterHub()` for the first time.

When `Y_DETECT_NONE` is used as detection `mode`, you must explicitly use `yRegisterHub()` to point the API to the VirtualHub on which your devices are connected before trying to access them.

Parameters :

mode an integer corresponding to the type of automatic device detection to use. Possible values are `Y_DETECT_NONE`, `Y_DETECT_USB`, `Y_DETECT_NET`, and `Y_DETECT_ALL`.

errmsg a string passed by reference to receive any error message.

Returns :

`YAPI_SUCCESS` when the call succeeds. On failure, throws an exception or returns a negative error code.

YAPI.PreregisterHub() YAPI
yPreregisterHub()

Fault-tolerant alternative to RegisterHub().

```
js      function yPreregisterHub( url, errmsg)
nodejs  function PreregisterHub( url, errmsg)
php     function yPreregisterHub( $url, &$errmsg)
cpp     YRETCODE yPreregisterHub( const string& url, string& errmsg)
m       YRETCODE yPreregisterHub( NSString * url, NSError** errmsg)
pas     function yPreregisterHub( url: string, var errmsg: string): integer
vb      function yPreregisterHub( ByVal url As String,
                                  ByRef errmsg As String) As Integer
cs      int PreregisterHub( string url, ref string errmsg)
java    synchronized static int PreregisterHub( String url)
py      def PreregisterHub( url, errmsg=None)
```

This function has the same purpose and same arguments as `RegisterHub()`, but does not trigger an error when the selected hub is not available at the time of the function call. This makes it possible to register a network hub independently of the current connectivity, and to try to contact it only when a device is actively needed.

Parameters :

url a string containing either **"usb"**,**"callback"** or the root URL of the hub to monitor

errmsg a string passed by reference to receive any error message.

Returns :

`YAPI_SUCCESS` when the call succeeds.

On failure, throws an exception or returns a negative error code.

YAPI.RegisterDeviceArrivalCallback() YAPI yRegisterDeviceArrivalCallback()

Register a callback function, to be called each time a device is pluged.

js	function **yRegisterDeviceArrivalCallback**(**arrivalCallback**)
nodejs	function **RegisterDeviceArrivalCallback**(**arrivalCallback**)
php	function **yRegisterDeviceArrivalCallback**(**$arrivalCallback**)
cpp	void **yRegisterDeviceArrivalCallback**(yDeviceUpdateCallback **arrivalCallback**)
m	void **yRegisterDeviceArrivalCallback**(yDeviceUpdateCallback **arrivalCallback**)
pas	procedure **yRegisterDeviceArrivalCallback**(**arrivalCallback**: yDeviceUpdateFunc)
vb	procedure **yRegisterDeviceArrivalCallback**(ByVal **arrivalCallback** As yDeviceUpdateFunc)
cs	void **RegisterDeviceArrivalCallback**(yDeviceUpdateFunc **arrivalCallback**)
java	synchronized static void **RegisterDeviceArrivalCallback**(DeviceArrivalCallback **arrivalCallback**)
py	def **RegisterDeviceArrivalCallback**(**arrivalCallback**)

This callback will be invoked while `yUpdateDeviceList` is running. You will have to call this function on a regular basis.

Parameters :

arrivalCallback a procedure taking a `YModule` parameter, or `null`

YAPI.RegisterDeviceRemovalCallback() yRegisterDeviceRemovalCallback()

YAPI

Register a callback function, to be called each time a device is unpluged.

js	function **yRegisterDeviceRemovalCallback**(**removalCallback**)
nodejs	function **RegisterDeviceRemovalCallback**(**removalCallback**)
php	function **yRegisterDeviceRemovalCallback**(**$removalCallback**)
cpp	void **yRegisterDeviceRemovalCallback**(yDeviceUpdateCallback **removalCallback**)
m	void **yRegisterDeviceRemovalCallback**(yDeviceUpdateCallback **removalCallback**)
pas	procedure **yRegisterDeviceRemovalCallback**(**removalCallback**: yDeviceUpdateFunc)
vb	procedure **yRegisterDeviceRemovalCallback**(ByVal **removalCallback** As yDeviceUpdateFunc)
cs	void **RegisterDeviceRemovalCallback**(yDeviceUpdateFunc **removalCallback**)
java	synchronized static void **RegisterDeviceRemovalCallback**(DeviceRemovalCallback **removalCallback**)
py	def **RegisterDeviceRemovalCallback**(**removalCallback**)

This callback will be invoked while `yUpdateDeviceList` is running. You will have to call this function on a regular basis.

Parameters :

removalCallback a procedure taking a `YModule` parameter, or `null`

YAPI.RegisterHub() YAPI
yRegisterHub()

Setup the Yoctopuce library to use modules connected on a given machine.

```
js      function yRegisterHub( url, errmsg)
nodejs  function RegisterHub( url, errmsg)
php     function yRegisterHub( $url, &$errmsg)
cpp     YRETCODE yRegisterHub( const string& url, string& errmsg)
m       YRETCODE yRegisterHub( NSString * url, NSError** errmsg)
pas     function yRegisterHub( url: string, var errmsg: string): integer
vb      function yRegisterHub( ByVal url As String,
                               ByRef errmsg As String) As Integer
cs      int RegisterHub( string url, ref string errmsg)
java    synchronized static int RegisterHub( String url)
py      def RegisterHub( url, errmsg=None)
```

The parameter will determine how the API will work. Use the follwing values:

usb: When the **usb** keyword is used, the API will work with devices connected directly to the USB bus. Some programming languages such a Javascript, PHP, and Java don't provide direct access to USB harware, so **usb** will not work with these. In this case, use a VirtualHub or a networked YoctoHub (see below).

x.x.x.x or ***hostname***: The API will use the devices connected to the host with the given IP address or hostname. That host can be a regular computer running a VirtualHub, or a networked YoctoHub such as YoctoHub-Ethernet or YoctoHub-Wireless. If you want to use the VirtualHub running on you local computer, use the IP address 127.0.0.1.

callback: that keywork make the API run in "*HTTP Callback*" mode. This a special mode allowing to take control of Yoctopuce devices through a NAT filter when using a VirtualHub ou a networked YoctoHub. You only need to configure your hub to call your server script on a regular basis. This mode is currently available for PHP and Node.JS only.

Be aware that only one application can use direct USB access at a given time on a machine. Multiple access would cause conflicts while trying to access the USB modules. In particular, this means that you must stop the VirtualHub software before starting an application that uses direct USB access. The workaround for this limitation is to setup the library to use the VirtualHub rather than direct USB access.

If acces control has been activated on the hub, virtual or not, you want to reach, the URL parameter should look like:

```
http://username:password@adresse:port
```

You can call *RegisterHub* several times to connect to several machines.

Parameters :

url a string containing either **"usb"**,**"callback"** or the root URL of the hub to monitor

errmsg a string passed by reference to receive any error message.

Returns :

YAPI_SUCCESS when the call succeeds.

On failure, throws an exception or returns a negative error code.

YAPI.RegisterHubDiscoveryCallback() YAPI yRegisterHubDiscoveryCallback()

Register a callback function, to be called each time a network hub or a VirtualHub is detected on the local network.

java void **RegisterHubDiscoveryCallback**(NewHubCallback **callback**)

Parameters :

callback a procedure taking a two string as parameter, or null

YAPI.RegisterLogFunction() YAPI
yRegisterLogFunction()

Registers a log callback function.

cpp	void **yRegisterLogFunction**(yLogFunction **logfun**)
m	void **yRegisterLogFunction**(yLogCallback **logfun**)
pas	procedure **yRegisterLogFunction**(**logfun**: yLogFunc)
vb	procedure **yRegisterLogFunction**(ByVal **logfun** As yLogFunc)
cs	void **RegisterLogFunction**(yLogFunc **logfun**)
java	void **RegisterLogFunction**(LogCallback **logfun**)
py	def **RegisterLogFunction**(**logfun**)

This callback will be called each time the API have something to say. Quite usefull to debug the API.

Parameters :

logfun a procedure taking a string parameter, or `null`

YAPI.SelectArchitecture() YAPI ySelectArchitecture()

Select the architecture or the library to be loaded to access to USB.

py def **SelectArchitecture**(**arch**)

By default, the Python library automatically detects the appropriate library to use. However, for Linux ARM, it not possible to reliably distinguish between a Hard Float (armhf) and a Soft Float (armel) install. For in this case, it is therefore recommended to manually select the proper architecture by calling `SelectArchitecture()` before any other call to the library.

Parameters :

arch A string containing the architecture to use. Possibles value are: `"armhf"`,`"armel"`, `"i386"`,`"x86_64"`,`"32bit"`, `"64bit"`

Returns :

nothing.

On failure, throws an exception.

YAPI.SetDelegate() YAPI ySetDelegate()

(Objective-C only) Register an object that must follow the procol YDeviceHotPlug.

m void **ySetDelegate**(id **object**)

The methodes yDeviceArrival and yDeviceRemoval will be invoked while yUpdateDeviceList is running. You will have to call this function on a regular basis.

Parameters :

object an object that must follow the procol YAPIDelegate, or nil

YAPI.SetTimeout() YAPI
ySetTimeout()

Invoke the specified callback function after a given timeout.

```
js      function ySetTimeout( callback, ms_timeout, arguments)
nodejs  function SetTimeout( callback, ms_timeout, arguments)
```

This function behaves more or less like Javascript `setTimeout`, but during the waiting time, it will call `yHandleEvents` and `yUpdateDeviceList` periodically, in order to keep the API up-to-date with current devices.

Parameters :

callback	the function to call after the timeout occurs. On Microsoft Internet Explorer, the callback must be provided as a string to be evaluated.
ms_timeout	an integer corresponding to the duration of the timeout, in milliseconds.
arguments	additional arguments to be passed to the callback function can be provided, if needed (not supported on Microsoft Internet Explorer).

Returns :

`YAPI_SUCCESS` when the call succeeds. On failure, throws an exception or returns a negative error code.

YAPI.Sleep() YAPI
ySleep()

Pauses the execution flow for a specified duration.

```
js      function ySleep( ms_duration, errmsg)
nodejs  function Sleep( ms_duration, errmsg)
php     function ySleep( $ms_duration, &$errmsg)
cpp     YRETCODE ySleep( unsigned ms_duration, string& errmsg)
m       YRETCODE ySleep( unsigned ms_duration, NSError ** errmsg)
pas     function ySleep( ms_duration: integer, var errmsg: string): integer
vb      function ySleep( ByVal ms_duration As Integer,
                         ByRef errmsg As String) As Integer
cs      int Sleep( int ms_duration, ref string errmsg)
java    int Sleep( long ms_duration)
py      def Sleep( ms_duration, errmsg=None)
```

This function implements a passive waiting loop, meaning that it does not consume CPU cycles significatively. The processor is left available for other threads and processes. During the pause, the library nevertheless reads from time to time information from the Yoctopuce modules by calling `yHandleEvents()`, in order to stay up-to-date.

This function may signal an error in case there is a communication problem while contacting a module.

Parameters :

ms_duration an integer corresponding to the duration of the pause, in milliseconds.

errmsg a string passed by reference to receive any error message.

Returns :

`YAPI_SUCCESS` when the call succeeds. On failure, throws an exception or returns a negative error code.

YAPI.UnregisterHub() YAPI yUnregisterHub()

Setup the Yoctopuce library to no more use modules connected on a previously registered machine with RegisterHub.

```
js      function yUnregisterHub( url)
nodejs  function UnregisterHub( url)
php     function yUnregisterHub( $url)
cpp     void yUnregisterHub( const string& url)
m       void yUnregisterHub( NSString * url)
pas     procedure yUnregisterHub( url: string)
vb      procedure yUnregisterHub( ByVal url As String)
cs      void UnregisterHub( string url)
java    synchronized static void UnregisterHub( String url)
py      def UnregisterHub( url)
```

Parameters :

url a string containing either **"usb"** or the

YAPI.UpdateDeviceList() YAPI yUpdateDeviceList()

Triggers a (re)detection of connected Yoctopuce modules.

```
js      function yUpdateDeviceList( errmsg)
nodejs  function UpdateDeviceList( errmsg)
php     function yUpdateDeviceList( &$errmsg)
cpp     YRETCODE yUpdateDeviceList( string& errmsg)
m       YRETCODE yUpdateDeviceList( NSError** errmsg)
pas     function yUpdateDeviceList( var errmsg: string): integer
vb      function yUpdateDeviceList( ByRef errmsg As String) As YRETCODE
cs      YRETCODE UpdateDeviceList( ref string errmsg)
java    int UpdateDeviceList( )
py      def UpdateDeviceList( errmsg=None)
```

The library searches the machines or USB ports previously registered using `yRegisterHub()`, and invokes any user-defined callback function in case a change in the list of connected devices is detected.

This function can be called as frequently as desired to refresh the device list and to make the application aware of hot-plug events.

Parameters :

errmsg a string passed by reference to receive any error message.

Returns :

`YAPI_SUCCESS` when the call succeeds. On failure, throws an exception or returns a negative error code.

YAPI.UpdateDeviceList_async() YAPI
yUpdateDeviceList_async()

Triggers a (re)detection of connected Yoctopuce modules.

```
js      function yUpdateDeviceList_async( callback, context)
nodejs  function UpdateDeviceList_async( callback, context)
```

The library searches the machines or USB ports previously registered using `yRegisterHub()`, and invokes any user-defined callback function in case a change in the list of connected devices is detected.

This function can be called as frequently as desired to refresh the device list and to make the application aware of hot-plug events.

This asynchronous version exists only in Javascript. It uses a callback instead of a return value in order to avoid blocking Firefox Javascript VM that does not implement context switching during blocking I/O calls.

Parameters :

callback callback function that is invoked when the result is known. The callback function receives three arguments: the caller-specific context object, the result code (`YAPI_SUCCESS` if the operation completes successfully) and the error message.

context caller-specific object that is passed as-is to the callback function

Returns :

nothing : the result is provided to the callback.

19.2. Module control interface

This interface is identical for all Yoctopuce USB modules. It can be used to control the module global parameters, and to enumerate the functions provided by each module.

In order to use the functions described here, you should include:

```
js      <script type='text/javascript' src='yocto_api.js'></script>
nodejs  var yoctolib = require('yoctolib');
        var YAPI = yoctolib.YAPI;
        var YModule = yoctolib.YModule;
php     require_once('yocto_api.php');
cpp     #include "yocto_api.h"
m       #import "yocto_api.h"
pas     uses yocto_api;
vb      yocto_api.vb
cs      yocto_api.cs
java    import com.yoctopuce.YoctoAPI.YModule;
py      from yocto_api import *
```

Global functions
yFindModule(**func**) Allows you to find a module from its serial number or from its logical name.
yFirstModule() Starts the enumeration of modules currently accessible.
`YModule` methods
module→describe() Returns a descriptive text that identifies the module.
module→download(**pathname**) Downloads the specified built-in file and returns a binary buffer with its content.
module→functionCount() Returns the number of functions (beside the "module" interface) available on the module.
module→functionId(**functionIndex**) Retrieves the hardware identifier of the *n*th function on the module.
module→functionName(**functionIndex**) Retrieves the logical name of the *n*th function on the module.
module→functionValue(**functionIndex**) Retrieves the advertised value of the *n*th function on the module.
module→get_beacon() Returns the state of the localization beacon.
module→get_errorMessage() Returns the error message of the latest error with this module object.
module→get_errorType() Returns the numerical error code of the latest error with this module object.
module→get_firmwareRelease() Returns the version of the firmware embedded in the module.
module→get_hardwareId() Returns the unique hardware identifier of the module.
module→get_icon2d()

Returns the icon of the module.

module→get_lastLogs()

Returns a string with last logs of the module.

module→get_logicalName()

Returns the logical name of the module.

module→get_luminosity()

Returns the luminosity of the module informative leds (from 0 to 100).

module→get_persistentSettings()

Returns the current state of persistent module settings.

module→get_productId()

Returns the USB device identifier of the module.

module→get_productName()

Returns the commercial name of the module, as set by the factory.

module→get_productRelease()

Returns the hardware release version of the module.

module→get_rebootCountdown()

Returns the remaining number of seconds before the module restarts, or zero when no reboot has been scheduled.

module→get_serialNumber()

Returns the serial number of the module, as set by the factory.

module→get_upTime()

Returns the number of milliseconds spent since the module was powered on.

module→get_usbBandwidth()

Returns the number of USB interfaces used by the module.

module→get_usbCurrent()

Returns the current consumed by the module on the USB bus, in milli-amps.

module→get_userData()

Returns the value of the userData attribute, as previously stored using method `set_userData`.

module→isOnline()

Checks if the module is currently reachable, without raising any error.

module→isOnline_async(**callback**, **context**)

Checks if the module is currently reachable, without raising any error.

module→load(**msValidity**)

Preloads the module cache with a specified validity duration.

module→load_async(**msValidity**, **callback**, **context**)

Preloads the module cache with a specified validity duration (asynchronous version).

module→nextModule()

Continues the module enumeration started using `yFirstModule()`.

module→reboot(**secBeforeReboot**)

Schedules a simple module reboot after the given number of seconds.

module→revertFromFlash()

Reloads the settings stored in the nonvolatile memory, as when the module is powered on.

module→saveToFlash()

Saves current settings in the nonvolatile memory of the module.

module→set_beacon(**newval**)

Turns on or off the module localization beacon.

module→set_logicalName(newval)

Changes the logical name of the module.

module→set_luminosity(newval)

Changes the luminosity of the module informative leds.

module→set_usbBandwidth(newval)

Changes the number of USB interfaces used by the module.

module→set_userData(data)

Stores a user context provided as argument in the userData attribute of the function.

module→triggerFirmwareUpdate(secBeforeReboot)

Schedules a module reboot into special firmware update mode.

module→wait_async(callback, context)

Waits for all pending asynchronous commands on the module to complete, and invoke the user-provided callback function.

YModule.FindModule() YModule
yFindModule()

Allows you to find a module from its serial number or from its logical name.

```
js      function yFindModule( func)
nodejs  function FindModule( func)
php     function yFindModule( $func)
cpp     YModule* yFindModule( string func)
m       +(YModule*) yFindModule : (NSString*) func
pas     function yFindModule( func: string): TYModule
vb      function yFindModule( ByVal func As String) As YModule
cs      YModule FindModule( string func)
java    YModule FindModule( String func)
py      def FindModule( func)
```

This function does not require that the module is online at the time it is invoked. The returned object is nevertheless valid. Use the method `YModule.isOnline()` to test if the module is indeed online at a given time. In case of ambiguity when looking for a module by logical name, no error is notified: the first instance found is returned. The search is performed first by hardware name, then by logical name.

Parameters :

func a string containing either the serial number or the logical name of the desired module

Returns :

a `YModule` object allowing you to drive the module or get additional information on the module.

YModule.FirstModule() YModule
yFirstModule()

Starts the enumeration of modules currently accessible.

```
js      function yFirstModule( )
nodejs  function FirstModule( )
php     function yFirstModule( )
cpp     YModule* yFirstModule( )
m       YModule* yFirstModule( )
pas     function yFirstModule( ): TYModule
vb      function yFirstModule( ) As YModule
cs      YModule FirstModule( )
java    YModule FirstModule( )
py      def FirstModule( )
```

Use the method `YModule.nextModule()` to iterate on the next modules.

Returns :

a pointer to a `YModule` object, corresponding to the first module currently online, or a `null` pointer if there are none.

module→describe() YModule

Returns a descriptive text that identifies the module.

```
js      function describe( )
nodejs  function describe( )
php     function describe( )
cpp     string describe( )
m       -(NSString*) describe
pas     function describe( ): string
vb      function describe( ) As String
cs      string describe( )
java    String describe( )
py      def describe( )
```

The text may include either the logical name or the serial number of the module.

Returns :
a string that describes the module

module→download() YModule

Downloads the specified built-in file and returns a binary buffer with its content.

```
js      function download( pathname)
nodejs  function download( pathname)
php     function download( $pathname)
cpp     string download( string pathname)
m       -(NSData*) download : (NSString*) pathname
pas     function download( pathname: string): TByteArray
vb      function download( ) As Byte
py      def download( pathname)
cmd     YModule target download pathname
```

Parameters :

pathname name of the new file to load

Returns :

a binary buffer with the file content

On failure, throws an exception or returns an empty content.

module→functionCount() YModule

Returns the number of functions (beside the "module" interface) available on the module.

```
js      function functionCount( )
nodejs  function functionCount( )
php     function functionCount( )
cpp     int functionCount( )
m       -(int) functionCount
pas     function functionCount( ): integer
vb      function functionCount( ) As Integer
cs      int functionCount( )
py      def functionCount( )
```

Returns :
the number of functions on the module

On failure, throws an exception or returns a negative error code.

module→functionId() YModule

Retrieves the hardware identifier of the *n*th function on the module.

```
js      function functionId( functionIndex)
nodejs  function functionId( functionIndex)
php     function functionId( $functionIndex)
cpp     string functionId( int functionIndex)
m       -(NSString*) functionId : (int) functionIndex
pas     function functionId( functionIndex: integer): string
vb      function functionId( ByVal functionIndex As Integer) As String
cs      string functionId( int functionIndex)
py      def functionId( functionIndex)
```

Parameters :

functionIndex the index of the function for which the information is desired, starting at 0 for the first function.

Returns :

a string corresponding to the unambiguous hardware identifier of the requested module function

On failure, throws an exception or returns an empty string.

module→functionName() YModule

Retrieves the logical name of the *n*th function on the module.

```
js      function functionName( functionIndex)
nodejs  function functionName( functionIndex)
php     function functionName( $functionIndex)
cpp     string functionName( int functionIndex)
m       -(NSString*) functionName : (int) functionIndex
pas     function functionName( functionIndex: integer): string
vb      function functionName( ByVal functionIndex As Integer) As String
cs      string functionName( int functionIndex)
py      def functionName( functionIndex)
```

Parameters :

functionIndex the index of the function for which the information is desired, starting at 0 for the first function.

Returns :

a string corresponding to the logical name of the requested module function

On failure, throws an exception or returns an empty string.

module→functionValue() YModule

Retrieves the advertised value of the *n*th function on the module.

```
js      function functionValue( functionIndex)
nodejs  function functionValue( functionIndex)
php     function functionValue( $functionIndex)
cpp     string functionValue( int functionIndex)
m       -(NSString*) functionValue : (int) functionIndex
pas     function functionValue( functionIndex: integer): string
vb      function functionValue( ByVal functionIndex As Integer) As String
cs      string functionValue( int functionIndex)
py      def functionValue( functionIndex)
```

Parameters :

functionIndex the index of the function for which the information is desired, starting at 0 for the first function.

Returns :

a short string (up to 6 characters) corresponding to the advertised value of the requested module function

On failure, throws an exception or returns an empty string.

module→get_beacon() YModule
module→beacon()

Returns the state of the localization beacon.

```
js      function get_beacon( )
nodejs  function get_beacon( )
php     function get_beacon( )
cpp     Y_BEACON_enum get_beacon( )
m       -(Y_BEACON_enum) beacon
pas     function get_beacon( ): Integer
vb      function get_beacon( ) As Integer
cs      int get_beacon( )
java    int get_beacon( )
py      def get_beacon( )
cmd     YModule target get_beacon
```

Returns :

either `Y_BEACON_OFF` or `Y_BEACON_ON`, according to the state of the localization beacon

On failure, throws an exception or returns `Y_BEACON_INVALID`.

module→get_errorMessage() YModule
module→errorMessage()

Returns the error message of the latest error with this module object.

js	function **get_errorMessage**( )
nodejs	function **get_errorMessage**( )
php	function **get_errorMessage**( )
cpp	string **get_errorMessage**( )
m	-(NSString*) errorMessage
pas	function **get_errorMessage**( ): string
vb	function **get_errorMessage**( ) As String
cs	string **get_errorMessage**( )
java	String **get_errorMessage**( )
py	def **get_errorMessage**( )

This method is mostly useful when using the Yoctopuce library with exceptions disabled.

Returns :
a string corresponding to the latest error message that occured while using this module object

module→get_errorType() YModule
module→errorType()

Returns the numerical error code of the latest error with this module object.

```
js      function get_errorType( )
nodejs  function get_errorType( )
php     function get_errorType( )
cpp     YRETCODE get_errorType( )
pas     function get_errorType( ): YRETCODE
vb      function get_errorType( ) As YRETCODE
cs      YRETCODE get_errorType( )
java    int get_errorType( )
py      def get_errorType( )
```

This method is mostly useful when using the Yoctopuce library with exceptions disabled.

Returns :
a number corresponding to the code of the latest error that occured while using this module object

module→get_firmwareRelease() YModule
module→firmwareRelease()

Returns the version of the firmware embedded in the module.

```
js      function get_firmwareRelease( )
nodejs  function get_firmwareRelease( )
php     function get_firmwareRelease( )
cpp     string get_firmwareRelease( )
m       -(NSString*) firmwareRelease
pas     function get_firmwareRelease( ): string
vb      function get_firmwareRelease( ) As String
cs      string get_firmwareRelease( )
java    String get_firmwareRelease( )
py      def get_firmwareRelease( )
cmd     YModule target get_firmwareRelease
```

Returns :

a string corresponding to the version of the firmware embedded in the module

On failure, throws an exception or returns `Y_FIRMWARERELEASE_INVALID`.

module→get_hardwareId() YModule
module→hardwareId()

Returns the unique hardware identifier of the module.

```
js      function get_hardwareId( )
nodejs  function get_hardwareId( )
php     function get_hardwareId( )
cpp     string get_hardwareId( )
m       -(NSString*) hardwareId
vb      function get_hardwareId( ) As String
cs      string get_hardwareId( )
java    String get_hardwareId( )
py      def get_hardwareId( )
```

The unique hardware identifier is made of the device serial number followed by string ".module".

Returns :
a string that uniquely identifies the module

module→get_icon2d() YModule
module→icon2d()

Returns the icon of the module.

```
js      function get_icon2d( )
nodejs  function get_icon2d( )
php     function get_icon2d( )
cpp     string get_icon2d( )
m       -(NSData*) icon2d
pas     function get_icon2d( ): TByteArray
vb      function get_icon2d( ) As Byte
py      def get_icon2d( )
cmd     YModule target get_icon2d
```

The icon is a PNG image and does not exceeds 1536 bytes.

Returns :
a binary buffer with module icon, in png format.

module→get_lastLogs() YModule
module→lastLogs()

Returns a string with last logs of the module.

```
js      function get_lastLogs( )
nodejs  function get_lastLogs( )
php     function get_lastLogs( )
cpp     string get_lastLogs( )
m       -(NSString*) lastLogs
pas     function get_lastLogs( ): string
vb      function get_lastLogs( ) As String
cs      string get_lastLogs( )
java    String get_lastLogs( )
py      def get_lastLogs( )
cmd     YModule target get_lastLogs
```

This method return only logs that are still in the module.

Returns :
a string with last logs of the module.

module→get_logicalName() YModule
module→logicalName()

Returns the logical name of the module.

```
js      function get_logicalName( )
nodejs  function get_logicalName( )
php     function get_logicalName( )
cpp     string get_logicalName( )
m       -(NSString*) logicalName
pas     function get_logicalName( ): string
vb      function get_logicalName( ) As String
cs      string get_logicalName( )
java    String get_logicalName( )
py      def get_logicalName( )
cmd     YModule target get_logicalName
```

Returns :
a string corresponding to the logical name of the module

On failure, throws an exception or returns `Y_LOGICALNAME_INVALID`.

module→get_luminosity() YModule
module→luminosity()

Returns the luminosity of the module informative leds (from 0 to 100).

```
js      function get_luminosity( )
nodejs  function get_luminosity( )
php     function get_luminosity( )
cpp     int get_luminosity( )
m       -(int) luminosity
pas     function get_luminosity( ): LongInt
vb      function get_luminosity( ) As Integer
cs      int get_luminosity( )
java    int get_luminosity( )
py      def get_luminosity( )
cmd     YModule target get_luminosity
```

Returns :
an integer corresponding to the luminosity of the module informative leds (from 0 to 100)

On failure, throws an exception or returns `Y_LUMINOSITY_INVALID`.

module→get_persistentSettings() YModule
module→persistentSettings()

Returns the current state of persistent module settings.

js	function **get_persistentSettings**( )
nodejs	function **get_persistentSettings**( )
php	function **get_persistentSettings**( )
cpp	Y_PERSISTENTSETTINGS_enum **get_persistentSettings**( )
m	-(Y_PERSISTENTSETTINGS_enum) persistentSettings
pas	function **get_persistentSettings**( ): Integer
vb	function **get_persistentSettings**( ) As Integer
cs	int **get_persistentSettings**( )
java	int **get_persistentSettings**( )
py	def **get_persistentSettings**( )
cmd	YModule **target get_persistentSettings**

Returns :

a value among `Y_PERSISTENTSETTINGS_LOADED`, `Y_PERSISTENTSETTINGS_SAVED` and `Y_PERSISTENTSETTINGS_MODIFIED` corresponding to the current state of persistent module settings

On failure, throws an exception or returns `Y_PERSISTENTSETTINGS_INVALID`.

module→get_productId() YModule
module→productId()

Returns the USB device identifier of the module.

```
js      function get_productId( )
nodejs  function get_productId( )
php     function get_productId( )
cpp     int get_productId( )
m       -(int) productId
pas     function get_productId( ): LongInt
vb      function get_productId( ) As Integer
cs      int get_productId( )
java    int get_productId( )
py      def get_productId( )
cmd     YModule target get_productId
```

Returns :
an integer corresponding to the USB device identifier of the module

On failure, throws an exception or returns `Y_PRODUCTID_INVALID`.

module→get_productName() YModule
module→productName()

Returns the commercial name of the module, as set by the factory.

```
js      function get_productName( )
nodejs  function get_productName( )
php     function get_productName( )
cpp     string get_productName( )
m       -(NSString*) productName
pas     function get_productName( ): string
vb      function get_productName( ) As String
cs      string get_productName( )
java    String get_productName( )
py      def get_productName( )
cmd     YModule target get_productName
```

Returns :
a string corresponding to the commercial name of the module, as set by the factory

On failure, throws an exception or returns `Y_PRODUCTNAME_INVALID`.

module→get_productRelease() YModule
module→productRelease()

Returns the hardware release version of the module.

```
js      function get_productRelease( )
nodejs  function get_productRelease( )
php     function get_productRelease( )
cpp     int get_productRelease( )
m       -(int) productRelease
pas     function get_productRelease( ): LongInt
vb      function get_productRelease( ) As Integer
cs      int get_productRelease( )
java    int get_productRelease( )
py      def get_productRelease( )
cmd     YModule target get_productRelease
```

Returns :
an integer corresponding to the hardware release version of the module

On failure, throws an exception or returns `Y_PRODUCTRELEASE_INVALID`.

module→get_rebootCountdown() YModule
module→rebootCountdown()

Returns the remaining number of seconds before the module restarts, or zero when no reboot has been scheduled.

```
js      function get_rebootCountdown( )
nodejs  function get_rebootCountdown( )
php     function get_rebootCountdown( )
cpp     int get_rebootCountdown( )
m       -(int) rebootCountdown
pas     function get_rebootCountdown( ): LongInt
vb      function get_rebootCountdown( ) As Integer
cs      int get_rebootCountdown( )
java    int get_rebootCountdown( )
py      def get_rebootCountdown( )
cmd     YModule target get_rebootCountdown
```

Returns :

an integer corresponding to the remaining number of seconds before the module restarts, or zero when no reboot has been scheduled

On failure, throws an exception or returns `Y_REBOOTCOUNTDOWN_INVALID`.

module→get_serialNumber() YModule
module→serialNumber()

Returns the serial number of the module, as set by the factory.

```
js      function get_serialNumber( )
nodejs  function get_serialNumber( )
php     function get_serialNumber( )
cpp     string get_serialNumber( )
m       -(NSString*) serialNumber
pas     function get_serialNumber( ): string
vb      function get_serialNumber( ) As String
cs      string get_serialNumber( )
java    String get_serialNumber( )
py      def get_serialNumber( )
cmd     YModule target get_serialNumber
```

Returns :
a string corresponding to the serial number of the module, as set by the factory

On failure, throws an exception or returns `Y_SERIALNUMBER_INVALID`.

module→get_upTime() YModule
module→upTime()

Returns the number of milliseconds spent since the module was powered on.

```
js      function get_upTime( )
nodejs  function get_upTime( )
php     function get_upTime( )
cpp     s64 get_upTime( )
m       -(s64) upTime
pas     function get_upTime( ): int64
vb      function get_upTime( ) As Long
cs      long get_upTime( )
java    long get_upTime( )
py      def get_upTime( )
cmd     YModule target get_upTime
```

Returns :

an integer corresponding to the number of milliseconds spent since the module was powered on

On failure, throws an exception or returns `Y_UPTIME_INVALID`.

module→get_usbBandwidth() YModule
module→usbBandwidth()

Returns the number of USB interfaces used by the module.

js	function **get_usbBandwidth**( )
nodejs	function **get_usbBandwidth**( )
php	function **get_usbBandwidth**( )
cpp	Y_USBBANDWIDTH_enum **get_usbBandwidth**( )
m	-(Y_USBBANDWIDTH_enum) usbBandwidth
pas	function **get_usbBandwidth**( ): Integer
vb	function **get_usbBandwidth**( ) As Integer
cs	int **get_usbBandwidth**( )
java	int **get_usbBandwidth**( )
py	def **get_usbBandwidth**( )
cmd	YModule **target get_usbBandwidth**

Returns :

either `Y_USBBANDWIDTH_SIMPLE` or `Y_USBBANDWIDTH_DOUBLE`, according to the number of USB interfaces used by the module

On failure, throws an exception or returns `Y_USBBANDWIDTH_INVALID`.

module→get_usbCurrent() YModule
module→usbCurrent()

Returns the current consumed by the module on the USB bus, in milli-amps.

```
js      function get_usbCurrent( )
nodejs  function get_usbCurrent( )
php     function get_usbCurrent( )
cpp     int get_usbCurrent( )
m       -(int) usbCurrent
pas     function get_usbCurrent( ): LongInt
vb      function get_usbCurrent( ) As Integer
cs      int get_usbCurrent( )
java    int get_usbCurrent( )
py      def get_usbCurrent( )
cmd     YModule target get_usbCurrent
```

Returns :

an integer corresponding to the current consumed by the module on the USB bus, in milli-amps

On failure, throws an exception or returns `Y_USBCURRENT_INVALID`.

module→get_userData() YModule
module→userData()

Returns the value of the userData attribute, as previously stored using method `set_userData`.

```
js      function get_userData( )
nodejs  function get_userData( )
php     function get_userData( )
cpp     void * get_userData( )
m       -(void*) userData
pas     function get_userData( ): Tobject
vb      function get_userData( ) As Object
cs      object get_userData( )
java    Object get_userData( )
py      def get_userData( )
```

This attribute is never touched directly by the API, and is at disposal of the caller to store a context.

Returns :
the object stored previously by the caller.

module→isOnline() YModule

Checks if the module is currently reachable, without raising any error.

```
js      function isOnline( )
nodejs  function isOnline( )
php     function isOnline( )
cpp     bool isOnline( )
m       -(BOOL) isOnline
pas     function isOnline( ): boolean
vb      function isOnline( ) As Boolean
cs      bool isOnline( )
java    boolean isOnline( )
py      def isOnline( )
```

If there are valid cached values for the module, that have not yet expired, the device is considered reachable. No exception is raised if there is an error while trying to contact the requested module.

Returns :

`true` if the module can be reached, and `false` otherwise

module→isOnline_async() YModule

Checks if the module is currently reachable, without raising any error.

```
js      function isOnline_async( callback, context)
nodejs  function isOnline_async( callback, context)
```

If there are valid cached values for the module, that have not yet expired, the device is considered reachable. No exception is raised if there is an error while trying to contact the requested module.

This asynchronous version exists only in Javascript. It uses a callback instead of a return value in order to avoid blocking Firefox Javascript VM that does not implement context switching during blocking I/O calls.

Parameters :

callback callback function that is invoked when the result is known. The callback function receives three arguments: the caller-specific context object, the receiving module object and the boolean result

context caller-specific object that is passed as-is to the callback function

Returns :

nothing : the result is provided to the callback.

module→load() YModule

Preloads the module cache with a specified validity duration.

```
js      function load( msValidity)
nodejs  function load( msValidity)
php     function load( $msValidity)
cpp     YRETCODE load( int msValidity)
m       -(YRETCODE) load : (int) msValidity
pas     function load( msValidity: integer): YRETCODE
vb      function load( ByVal msValidity As Integer) As YRETCODE
cs      YRETCODE load( int msValidity)
java    int load( long msValidity)
py      def load( msValidity)
```

By default, whenever accessing a device, all module attributes are kept in cache for the standard duration (5 ms). This method can be used to temporarily mark the cache as valid for a longer period, in order to reduce network trafic for instance.

Parameters :

msValidity an integer corresponding to the validity attributed to the loaded module parameters, in milliseconds

Returns :

YAPI_SUCCESS when the call succeeds. On failure, throws an exception or returns a negative error code.

module→load_async() YModule

Preloads the module cache with a specified validity duration (asynchronous version).

```
js      function load_async( msValidity, callback, context)
nodejs  function load_async( msValidity, callback, context)
```

By default, whenever accessing a device, all module attributes are kept in cache for the standard duration (5 ms). This method can be used to temporarily mark the cache as valid for a longer period, in order to reduce network trafic for instance. This asynchronous version exists only in Javascript. It uses a callback instead of a return value in order to avoid blocking Firefox javascript VM that does not implement context switching during blocking I/O calls. See the documentation section on asynchronous Javascript calls for more details.

Parameters :

msValidity	an integer corresponding to the validity of the loaded module parameters, in milliseconds
callback	callback function that is invoked when the result is known. The callback function receives three arguments: the caller-specific context object, the receiving module object and the error code (or YAPI_SUCCESS)
context	caller-specific object that is passed as-is to the callback function

Returns :

nothing : the result is provided to the callback.

module→nextModule() YModule

Continues the module enumeration started using `yFirstModule()`.

```
js      function nextModule( )
nodejs  function nextModule( )
php     function nextModule( )
cpp     YModule * nextModule( )
m       -(YModule*) nextModule
pas     function nextModule( ): TYModule
vb      function nextModule( ) As YModule
cs      YModule nextModule( )
java    YModule nextModule( )
py      def nextModule( )
```

Returns :

a pointer to a `YModule` object, corresponding to the next module found, or a `null` pointer if there are no more modules to enumerate.

module→reboot() YModule

Schedules a simple module reboot after the given number of seconds.

```
js      function reboot( secBeforeReboot)
nodejs  function reboot( secBeforeReboot)
php     function reboot( $secBeforeReboot)
cpp     int reboot( int secBeforeReboot)
m       -(int) reboot : (int) secBeforeReboot
pas     function reboot( secBeforeReboot: LongInt): LongInt
vb      function reboot( ) As Integer
cs      int reboot( int secBeforeReboot)
java    int reboot( int secBeforeReboot)
py      def reboot( secBeforeReboot)
cmd     YModule target reboot secBeforeReboot
```

Parameters :

secBeforeReboot number of seconds before rebooting

Returns :

YAPI_SUCCESS when the call succeeds. On failure, throws an exception or returns a negative error code.

module→revertFromFlash() YModule

Reloads the settings stored in the nonvolatile memory, as when the module is powered on.

```
js      function revertFromFlash( )
nodejs  function revertFromFlash( )
php     function revertFromFlash( )
cpp     int revertFromFlash( )
m       -(int) revertFromFlash
pas     function revertFromFlash( ): LongInt
vb      function revertFromFlash( ) As Integer
cs      int revertFromFlash( )
java    int revertFromFlash( )
py      def revertFromFlash( )
cmd     YModule target revertFromFlash
```

Returns :

YAPI_SUCCESS when the call succeeds. On failure, throws an exception or returns a negative error code.

module→saveToFlash() YModule

Saves current settings in the nonvolatile memory of the module.

```
js      function saveToFlash( )
nodejs  function saveToFlash( )
php     function saveToFlash( )
cpp     int saveToFlash( )
m       -(int) saveToFlash
pas     function saveToFlash( ): LongInt
vb      function saveToFlash( ) As Integer
cs      int saveToFlash( )
java    int saveToFlash( )
py      def saveToFlash( )
cmd     YModule target saveToFlash
```

Warning: the number of allowed save operations during a module life is limited (about 100000 cycles). Do not call this function within a loop.

Returns :

YAPI_SUCCESS when the call succeeds. On failure, throws an exception or returns a negative error code.

module→set_beacon() YModule
module→setBeacon()

Turns on or off the module localization beacon.

js	function **set_beacon**(**newval**)
nodejs	function **set_beacon**(**newval**)
php	function **set_beacon**(**$newval**)
cpp	int **set_beacon**(Y_BEACON_enum **newval**)
m	-(int) setBeacon : (Y_BEACON_enum) **newval**
pas	function **set_beacon**(**newval**: Integer): integer
vb	function **set_beacon**(ByVal **newval** As Integer) As Integer
cs	int **set_beacon**(int **newval**)
java	int **set_beacon**(int **newval**)
py	def **set_beacon**(**newval**)
cmd	YModule **target set_beacon newval**

Parameters :

newval either `Y_BEACON_OFF` or `Y_BEACON_ON`

Returns :

`YAPI_SUCCESS` if the call succeeds.

On failure, throws an exception or returns a negative error code.

module→set_logicalName() YModule
module→setLogicalName()

Changes the logical name of the module.

```
js      function set_logicalName( newval)
nodejs  function set_logicalName( newval)
php     function set_logicalName( $newval)
cpp     int set_logicalName( const string& newval)
m       -(int) setLogicalName : (NSString*) newval
pas     function set_logicalName( newval: string): integer
vb      function set_logicalName( ByVal newval As String) As Integer
cs      int set_logicalName( string newval)
java    int set_logicalName( String newval)
py      def set_logicalName( newval)
cmd     YModule target set_logicalName newval
```

You can use `yCheckLogicalName()` prior to this call to make sure that your parameter is valid. Remember to call the `saveToFlash()` method of the module if the modification must be kept.

Parameters :

newval a string corresponding to the logical name of the module

Returns :

`YAPI_SUCCESS` if the call succeeds.

On failure, throws an exception or returns a negative error code.

module→set_luminosity() YModule
module→setLuminosity()

Changes the luminosity of the module informative leds.

```
js      function set_luminosity( newval)
nodejs  function set_luminosity( newval)
php     function set_luminosity( $newval)
cpp     int set_luminosity( int newval)
m       -(int) setLuminosity : (int) newval
pas     function set_luminosity( newval: LongInt): integer
vb      function set_luminosity( ByVal newval As Integer) As Integer
cs      int set_luminosity( int newval)
java    int set_luminosity( int newval)
py      def set_luminosity( newval)
cmd     YModule target set_luminosity newval
```

The parameter is a value between 0 and 100. Remember to call the `saveToFlash()` method of the module if the modification must be kept.

Parameters :

newval an integer corresponding to the luminosity of the module informative leds

Returns :

`YAPI_SUCCESS` if the call succeeds.

On failure, throws an exception or returns a negative error code.

module→set_usbBandwidth() YModule
module→setUsbBandwidth()

Changes the number of USB interfaces used by the module.

```
js      function set_usbBandwidth( newval)
nodejs  function set_usbBandwidth( newval)
php     function set_usbBandwidth( $newval)
cpp     int set_usbBandwidth( Y_USBBANDWIDTH_enum newval)
m       -(int) setUsbBandwidth : (Y_USBBANDWIDTH_enum) newval
pas     function set_usbBandwidth( newval: Integer): integer
vb      function set_usbBandwidth( ByVal newval As Integer) As Integer
cs      int set_usbBandwidth( int newval)
java    int set_usbBandwidth( int newval)
py      def set_usbBandwidth( newval)
cmd     YModule target set_usbBandwidth newval
```

You must reboot the module after changing this setting.

Parameters :

newval either `Y_USBBANDWIDTH_SIMPLE` or `Y_USBBANDWIDTH_DOUBLE`, according to the number of USB interfaces used by the module

Returns :

`YAPI_SUCCESS` if the call succeeds.

On failure, throws an exception or returns a negative error code.

module→set_userData() YModule
module→setUserData()

Stores a user context provided as argument in the userData attribute of the function.

```
js      function set_userData( data)
nodejs  function set_userData( data)
php     function set_userData( $data)
cpp     void set_userData( void* data)
m       -(void) setUserData : (void*) data
pas     procedure set_userData( data: Tobject)
vb      procedure set_userData( ByVal data As Object)
cs      void set_userData( object data)
java    void set_userData( Object data)
py      def set_userData( data)
```

This attribute is never touched by the API, and is at disposal of the caller to store a context.

Parameters :

data any kind of object to be stored

module→triggerFirmwareUpdate() YModule

Schedules a module reboot into special firmware update mode.

```
js      function triggerFirmwareUpdate( secBeforeReboot)
nodejs  function triggerFirmwareUpdate( secBeforeReboot)
php     function triggerFirmwareUpdate( $secBeforeReboot)
cpp     int triggerFirmwareUpdate( int secBeforeReboot)
m       -(int) triggerFirmwareUpdate : (int) secBeforeReboot
pas     function triggerFirmwareUpdate( secBeforeReboot: LongInt): LongInt
vb      function triggerFirmwareUpdate( ) As Integer
cs      int triggerFirmwareUpdate( int secBeforeReboot)
java    int triggerFirmwareUpdate( int secBeforeReboot)
py      def triggerFirmwareUpdate( secBeforeReboot)
cmd     YModule target triggerFirmwareUpdate secBeforeReboot
```

Parameters :

secBeforeReboot number of seconds before rebooting

Returns :

YAPI_SUCCESS when the call succeeds. On failure, throws an exception or returns a negative error code.

module→wait_async() YModule

Waits for all pending asynchronous commands on the module to complete, and invoke the user-provided callback function.

```
js      function wait_async( callback, context)
nodejs  function wait_async( callback, context)
```

The callback function can therefore freely issue synchronous or asynchronous commands, without risking to block the Javascript VM.

Parameters :

callback callback function that is invoked when all pending commands on the module are completed. The callback function receives two arguments: the caller-specific context object and the receiving function object.

context caller-specific object that is passed as-is to the callback function

Returns :

nothing.

19.3. Relay function interface

The Yoctopuce application programming interface allows you to switch the relay state. This change is not persistent: the relay will automatically return to its idle position whenever power is lost or if the module is restarted. The library can also generate automatically short pulses of determined duration. On devices with two output for each relay (double throw), the two outputs are named A and B, with output A corresponding to the idle position (at power off) and the output B corresponding to the active state. If you prefer the alternate default state, simply switch your cables on the board.

In order to use the functions described here, you should include:

```
js      <script type='text/javascript' src='yocto_relay.js'></script>
nodejs  var yoctolib = require('yoctolib');
        var YRelay = yoctolib.YRelay;
php     require_once('yocto_relay.php');
cpp     #include "yocto_relay.h"
m       #import "yocto_relay.h"
pas     uses yocto_relay;
vb      yocto_relay.vb
cs      yocto_relay.cs
java    import com.yoctopuce.YoctoAPI.YRelay;
py      from yocto_relay import *
```

Global functions
yFindRelay(**func**) Retrieves a relay for a given identifier.
yFirstRelay() Starts the enumeration of relays currently accessible.
YRelay methods
relay→delayedPulse(**ms_delay**, **ms_duration**) Schedules a pulse.
relay→describe() Returns a short text that describes the relay in the form TYPE(NAME)=SERIAL.FUNCTIONID.
relay→get_advertisedValue() Returns the current value of the relay (no more than 6 characters).
relay→get_countdown() Returns the number of milliseconds remaining before a pulse (delayedPulse() call) When there is no scheduled pulse, returns zero.
relay→get_errorMessage() Returns the error message of the latest error with the relay.
relay→get_errorType() Returns the numerical error code of the latest error with the relay.
relay→get_friendlyName() Returns a global identifier of the relay in the format MODULE_NAME.FUNCTION_NAME.
relay→get_functionDescriptor() Returns a unique identifier of type YFUN_DESCR corresponding to the function.
relay→get_functionId() Returns the hardware identifier of the relay, without reference to the module.
relay→get_hardwareId()

Returns the unique hardware identifier of the relay in the form `SERIAL.FUNCTIONID`.

relay→get_logicalName()

Returns the logical name of the relay.

relay→get_maxTimeOnStateA()

Retourne the maximum time (ms) allowed for $THEFUNCTIONS$ to stay in state A before automatically switching back in to B state.

relay→get_maxTimeOnStateB()

Retourne the maximum time (ms) allowed for $THEFUNCTIONS$ to stay in state B before automatically switching back in to A state.

relay→get_module()

Gets the `YModule` object for the device on which the function is located.

relay→get_module_async(**callback**, **context**)

Gets the `YModule` object for the device on which the function is located (asynchronous version).

relay→get_output()

Returns the output state of the relays, when used as a simple switch (single throw).

relay→get_pulseTimer()

Returns the number of milliseconds remaining before the relays is returned to idle position (state A), during a measured pulse generation.

relay→get_state()

Returns the state of the relays (A for the idle position, B for the active position).

relay→get_stateAtPowerOn()

Returns the state of the relays at device startup (A for the idle position, B for the active position, UNCHANGED for no change).

relay→get_userData()

Returns the value of the userData attribute, as previously stored using method `set_userData`.

relay→isOnline()

Checks if the relay is currently reachable, without raising any error.

relay→isOnline_async(**callback**, **context**)

Checks if the relay is currently reachable, without raising any error (asynchronous version).

relay→load(**msValidity**)

Preloads the relay cache with a specified validity duration.

relay→load_async(**msValidity**, **callback**, **context**)

Preloads the relay cache with a specified validity duration (asynchronous version).

relay→nextRelay()

Continues the enumeration of relays started using `yFirstRelay()`.

relay→pulse(**ms_duration**)

Sets the relay to output B (active) for a specified duration, then brings it automatically back to output A (idle state).

relay→registerValueCallback(**callback**)

Registers the callback function that is invoked on every change of advertised value.

relay→set_logicalName(**newval**)

Changes the logical name of the relay.

relay→set_maxTimeOnStateA(**newval**)

Sets the maximum time (ms) allowed for $THEFUNCTIONS$ to stay in state A before automatically switching back in to B state.

relay→set_maxTimeOnStateB(**newval**)

Sets the maximum time (ms) allowed for $THEFUNCTIONS$ to stay in state B before automatically switching back in to A state.

relay→set_output(**newval**)

Changes the output state of the relays, when used as a simple switch (single throw).

relay→set_state(**newval**)

Changes the state of the relays (A for the idle position, B for the active position).

relay→set_stateAtPowerOn(**newval**)

Preset the state of the relays at device startup (A for the idle position, B for the active position, UNCHANGED for no modification).

relay→set_userData(**data**)

Stores a user context provided as argument in the userData attribute of the function.

relay→wait_async(**callback**, **context**)

Waits for all pending asynchronous commands on the module to complete, and invoke the user-provided callback function.

YRelay.FindRelay() YRelay
yFindRelay()

Retrieves a relay for a given identifier.

```
js      function yFindRelay( func)
nodejs  function FindRelay( func)
php     function yFindRelay( $func)
cpp     YRelay* yFindRelay( const string& func)
m       YRelay* yFindRelay( NSString* func)
pas     function yFindRelay( func: string): TYRelay
vb      function yFindRelay( ByVal func As String) As YRelay
cs      YRelay FindRelay( string func)
java    YRelay FindRelay( String func)
py      def FindRelay( func)
```

The identifier can be specified using several formats:

- FunctionLogicalName
- ModuleSerialNumber.FunctionIdentifier
- ModuleSerialNumber.FunctionLogicalName
- ModuleLogicalName.FunctionIdentifier
- ModuleLogicalName.FunctionLogicalName

This function does not require that the relay is online at the time it is invoked. The returned object is nevertheless valid. Use the method `YRelay.isOnline()` to test if the relay is indeed online at a given time. In case of ambiguity when looking for a relay by logical name, no error is notified: the first instance found is returned. The search is performed first by hardware name, then by logical name.

Parameters :

func a string that uniquely characterizes the relay

Returns :

a `YRelay` object allowing you to drive the relay.

YRelay.FirstRelay()
yFirstRelay()

YRelay

Starts the enumeration of relays currently accessible.

```
js      function yFirstRelay( )
nodejs  function FirstRelay( )
php     function yFirstRelay( )
cpp     YRelay* yFirstRelay( )
m       YRelay* yFirstRelay( )
pas     function yFirstRelay( ): TYRelay
vb      function yFirstRelay( ) As YRelay
cs      YRelay FirstRelay( )
java    YRelay FirstRelay( )
py      def FirstRelay( )
```

Use the method `YRelay.nextRelay()` to iterate on next relays.

Returns :

a pointer to a `YRelay` object, corresponding to the first relay currently online, or a `null` pointer if there are none.

relay→delayedPulse() YRelay

Schedules a pulse.

```
js      function delayedPulse( ms_delay, ms_duration)
nodejs  function delayedPulse( ms_delay, ms_duration)
php     function delayedPulse( $ms_delay, $ms_duration)
cpp     int delayedPulse( int ms_delay, int ms_duration)
m       -(int) delayedPulse : (int) ms_delay : (int) ms_duration
pas     function delayedPulse( ms_delay: LongInt, ms_duration: LongInt): integer
vb      function delayedPulse( ByVal ms_delay As Integer,
                               ByVal ms_duration As Integer) As Integer
cs      int delayedPulse( int ms_delay, int ms_duration)
java    int delayedPulse( int ms_delay, int ms_duration)
py      def delayedPulse( ms_delay, ms_duration)
cmd     YRelay target delayedPulse ms_delay ms_duration
```

Parameters :

ms_delay waiting time before the pulse, in millisecondes

ms_duration pulse duration, in millisecondes

Returns :

YAPI_SUCCESS if the call succeeds.

On failure, throws an exception or returns a negative error code.

relay→describe() YRelay

Returns a short text that describes the relay in the form TYPE(NAME)=SERIAL.FUNCTIONID.

```
js      function describe( )
nodejs  function describe( )
php     function describe( )
cpp     string describe( )
m       -(NSString*) describe
pas     function describe( ): string
vb      function describe( ) As String
cs      string describe( )
java    String describe( )
py      def describe( )
```

More precisely, TYPE is the type of the function, NAME it the name used for the first access to the function, SERIAL is the serial number of the module if the module is connected or "unresolved", and FUNCTIONID is the hardware identifier of the function if the module is connected. For example, this method returns Relay(MyCustomName.relay1)=RELAYLO1-123456.relay1 if the module is already connected or Relay(BadCustomeName.relay1)=unresolved if the module has not yet been connected. This method does not trigger any USB or TCP transaction and can therefore be used in a debugger.

Returns :

a string that describes the relay (ex: Relay(MyCustomName.relay1)=RELAYLO1-123456.relay1)

relay→get_advertisedValue() YRelay
relay→advertisedValue()

Returns the current value of the relay (no more than 6 characters).

```
js      function get_advertisedValue( )
nodejs  function get_advertisedValue( )
php     function get_advertisedValue( )
cpp     string get_advertisedValue( )
m       -(NSString*) advertisedValue
pas     function get_advertisedValue( ): string
vb      function get_advertisedValue( ) As String
cs      string get_advertisedValue( )
java    String get_advertisedValue( )
py      def get_advertisedValue( )
cmd     YRelay target get_advertisedValue
```

Returns :

a string corresponding to the current value of the relay (no more than 6 characters). On failure, throws an exception or returns `Y_ADVERTISEDVALUE_INVALID`.

relay→get_countdown() YRelay
relay→countdown()

Returns the number of milliseconds remaining before a pulse (delayedPulse() call) When there is no scheduled pulse, returns zero.

```
js      function get_countdown( )
nodejs  function get_countdown( )
php     function get_countdown( )
cpp     s64 get_countdown( )
m       -(s64) countdown
pas     function get_countdown( ): int64
vb      function get_countdown( ) As Long
cs      long get_countdown( )
java    long get_countdown( )
py      def get_countdown( )
cmd     YRelay target get_countdown
```

Returns :

an integer corresponding to the number of milliseconds remaining before a pulse (delayedPulse() call) When there is no scheduled pulse, returns zero

On failure, throws an exception or returns `Y_COUNTDOWN_INVALID`.

relay→get_errorMessage() YRelay
relay→errorMessage()

Returns the error message of the latest error with the relay.

```
js      function get_errorMessage( )
nodejs  function get_errorMessage( )
php     function get_errorMessage( )
cpp     string get_errorMessage( )
m       -(NSString*) errorMessage
pas     function get_errorMessage( ): string
vb      function get_errorMessage( ) As String
cs      string get_errorMessage( )
java    String get_errorMessage( )
py      def get_errorMessage( )
```

This method is mostly useful when using the Yoctopuce library with exceptions disabled.

Returns :
a string corresponding to the latest error message that occured while using the relay object

relay→get_errorType() YRelay
relay→errorType()

Returns the numerical error code of the latest error with the relay.

```
js      function get_errorType( )
nodejs  function get_errorType( )
php     function get_errorType( )
cpp     YRETCODE get_errorType( )
pas     function get_errorType( ): YRETCODE
vb      function get_errorType( ) As YRETCODE
cs      YRETCODE get_errorType( )
java    int get_errorType( )
py      def get_errorType( )
```

This method is mostly useful when using the Yoctopuce library with exceptions disabled.

Returns :
a number corresponding to the code of the latest error that occured while using the relay object

relay→get_friendlyName() YRelay
relay→friendlyName()

Returns a global identifier of the relay in the format MODULE_NAME.FUNCTION_NAME.

```
js       function get_friendlyName( )
nodejs   function get_friendlyName( )
php      function get_friendlyName( )
cpp      string get_friendlyName( )
m        -(NSString*) friendlyName
cs       string get_friendlyName( )
java     String get_friendlyName( )
py       def get_friendlyName( )
```

The returned string uses the logical names of the module and of the relay if they are defined, otherwise the serial number of the module and the hardware identifier of the relay (for exemple: MyCustomName.relay1)

Returns :

a string that uniquely identifies the relay using logical names (ex: MyCustomName.relay1) On failure, throws an exception or returns Y_FRIENDLYNAME_INVALID.

relay→get_functionDescriptor() YRelay
relay→functionDescriptor()

Returns a unique identifier of type YFUN_DESCR corresponding to the function.

```
js      function get_functionDescriptor( )
nodejs  function get_functionDescriptor( )
php     function get_functionDescriptor( )
cpp     YFUN_DESCR get_functionDescriptor( )
m       -(YFUN_DESCR) functionDescriptor
pas     function get_functionDescriptor( ): YFUN_DESCR
vb      function get_functionDescriptor( ) As YFUN_DESCR
cs      YFUN_DESCR get_functionDescriptor( )
java    String get_functionDescriptor( )
py      def get_functionDescriptor( )
```

This identifier can be used to test if two instances of YFunction reference the same physical function on the same physical device.

Returns :

an identifier of type YFUN_DESCR. If the function has never been contacted, the returned value is Y_FUNCTIONDESCRIPTOR_INVALID.

relay→get_functionId() YRelay
relay→functionId()

Returns the hardware identifier of the relay, without reference to the module.

js	function **get_functionId**( )
nodejs	function **get_functionId**( )
php	function **get_functionId**( )
cpp	string **get_functionId**( )
m	-(NSString*) functionId
vb	function **get_functionId**( ) As String
cs	string **get_functionId**( )
java	String **get_functionId**( )
py	def **get_functionId**( )

For example `relay1`

Returns :

a string that identifies the relay (ex: `relay1`) On failure, throws an exception or returns `Y_FUNCTIONID_INVALID`.

relay→get_hardwareId() YRelay
relay→hardwareId()

Returns the unique hardware identifier of the relay in the form SERIAL.FUNCTIONID.

```
js      function get_hardwareId( )
nodejs  function get_hardwareId( )
php     function get_hardwareId( )
cpp     string get_hardwareId( )
m       -(NSString*) hardwareId
vb      function get_hardwareId( ) As String
cs      string get_hardwareId( )
java    String get_hardwareId( )
py      def get_hardwareId( )
```

The unique hardware identifier is composed of the device serial number and of the hardware identifier of the relay. (for example RELAYLO1-123456.relay1)

Returns :

a string that uniquely identifies the relay (ex: RELAYLO1-123456.relay1) On failure, throws an exception or returns Y_HARDWAREID_INVALID.

relay→get_logicalName() YRelay
relay→logicalName()

Returns the logical name of the relay.

```
js      function get_logicalName( )
nodejs  function get_logicalName( )
php     function get_logicalName( )
cpp     string get_logicalName( )
m       -(NSString*) logicalName
pas     function get_logicalName( ): string
vb      function get_logicalName( ) As String
cs      string get_logicalName( )
java    String get_logicalName( )
py      def get_logicalName( )
cmd     YRelay target get_logicalName
```

Returns :

a string corresponding to the logical name of the relay. On failure, throws an exception or returns `Y_LOGICALNAME_INVALID`.

relay→get_maxTimeOnStateA() YRelay
relay→maxTimeOnStateA()

Retourne the maximum time (ms) allowed for $THEFUNCTIONS$ to stay in state A before automatically switching back in to B state.

```
js      function get_maxTimeOnStateA( )
nodejs  function get_maxTimeOnStateA( )
php     function get_maxTimeOnStateA( )
cpp     s64 get_maxTimeOnStateA( )
m       -(s64) maxTimeOnStateA
pas     function get_maxTimeOnStateA( ): int64
vb      function get_maxTimeOnStateA( ) As Long
cs      long get_maxTimeOnStateA( )
java    long get_maxTimeOnStateA( )
py      def get_maxTimeOnStateA( )
cmd     YRelay target get_maxTimeOnStateA
```

Zero means no maximum time.

Returns :
an integer

On failure, throws an exception or returns `Y_MAXTIMEONSTATEA_INVALID`.

relay→get_maxTimeOnStateB() YRelay
relay→maxTimeOnStateB()

Retourne the maximum time (ms) allowed for $THEFUNCTIONS$ to stay in state B before automatically switching back in to A state.

js	function **get_maxTimeOnStateB**( )
nodejs	function **get_maxTimeOnStateB**( )
php	function **get_maxTimeOnStateB**( )
cpp	s64 **get_maxTimeOnStateB**( )
m	-(s64) maxTimeOnStateB
pas	function **get_maxTimeOnStateB**( ): int64
vb	function **get_maxTimeOnStateB**( ) As Long
cs	long **get_maxTimeOnStateB**( )
java	long **get_maxTimeOnStateB**( )
py	def **get_maxTimeOnStateB**( )
cmd	YRelay **target** **get_maxTimeOnStateB**

Zero means no maximum time.

Returns :
an integer

On failure, throws an exception or returns `Y_MAXTIMEONSTATEB_INVALID`.

relay→get_module() YRelay
relay→module()

Gets the YModule object for the device on which the function is located.

```
js      function get_module( )
nodejs  function get_module( )
php     function get_module( )
cpp     YModule * get_module( )
m       -(YModule*) module
pas     function get_module( ): TYModule
vb      function get_module( ) As YModule
cs      YModule get_module( )
java    YModule get_module( )
py      def get_module( )
```

If the function cannot be located on any module, the returned instance of YModule is not shown as on-line.

Returns :
an instance of YModule

relay→get_module_async() YRelay
relay→module_async()

Gets the YModule object for the device on which the function is located (asynchronous version).

```
js      function get_module_async( callback, context)
nodejs  function get_module_async( callback, context)
```

If the function cannot be located on any module, the returned YModule object does not show as online. This asynchronous version exists only in Javascript. It uses a callback instead of a return value in order to avoid blocking Firefox javascript VM that does not implement context switching during blocking I/O calls. See the documentation section on asynchronous Javascript calls for more details.

Parameters :

callback callback function that is invoked when the result is known. The callback function receives three arguments: the caller-specific context object, the receiving function object and the requested YModule object

context caller-specific object that is passed as-is to the callback function

Returns :

nothing : the result is provided to the callback.

relay→get_output() YRelay
relay→output()

Returns the output state of the relays, when used as a simple switch (single throw).

```
js      function get_output( )
nodejs  function get_output( )
php     function get_output( )
cpp     Y_OUTPUT_enum get_output( )
m       -(Y_OUTPUT_enum) output
pas     function get_output( ): Integer
vb      function get_output( ) As Integer
cs      int get_output( )
java    int get_output( )
py      def get_output( )
cmd     YRelay target get_output
```

Returns :

either `Y_OUTPUT_OFF` or `Y_OUTPUT_ON`, according to the output state of the relays, when used as a simple switch (single throw)

On failure, throws an exception or returns `Y_OUTPUT_INVALID`.

relay→get_pulseTimer() YRelay
relay→pulseTimer()

Returns the number of milliseconds remaining before the relays is returned to idle position (state A), during a measured pulse generation.

```
js      function get_pulseTimer( )
nodejs  function get_pulseTimer( )
php     function get_pulseTimer( )
cpp     s64 get_pulseTimer( )
m       -(s64) pulseTimer
pas     function get_pulseTimer( ): int64
vb      function get_pulseTimer( ) As Long
cs      long get_pulseTimer( )
java    long get_pulseTimer( )
py      def get_pulseTimer( )
cmd     YRelay target get_pulseTimer
```

When there is no ongoing pulse, returns zero.

Returns :

an integer corresponding to the number of milliseconds remaining before the relays is returned to idle position (state A), during a measured pulse generation

On failure, throws an exception or returns `Y_PULSETIMER_INVALID`.

relay→get_state() YRelay
relay→state()

Returns the state of the relays (A for the idle position, B for the active position).

```
js      function get_state( )
nodejs  function get_state( )
php     function get_state( )
cpp     Y_STATE_enum get_state( )
m       -(Y_STATE_enum) state
pas     function get_state( ): Integer
vb      function get_state( ) As Integer
cs      int get_state( )
java    int get_state( )
py      def get_state( )
cmd     YRelay target get_state
```

Returns :

either Y_STATE_A or Y_STATE_B, according to the state of the relays (A for the idle position, B for the active position)

On failure, throws an exception or returns Y_STATE_INVALID.

relay→get_stateAtPowerOn() YRelay
relay→stateAtPowerOn()

Returns the state of the relays at device startup (A for the idle position, B for the active position, UNCHANGED for no change).

js	function **get_stateAtPowerOn**( )
nodejs	function **get_stateAtPowerOn**( )
php	function **get_stateAtPowerOn**( )
cpp	Y_STATEATPOWERON_enum **get_stateAtPowerOn**( )
m	-(Y_STATEATPOWERON_enum) stateAtPowerOn
pas	function **get_stateAtPowerOn**( ): Integer
vb	function **get_stateAtPowerOn**( ) As Integer
cs	int **get_stateAtPowerOn**( )
java	int **get_stateAtPowerOn**( )
py	def **get_stateAtPowerOn**( )
cmd	YRelay **target** **get_stateAtPowerOn**

Returns :

a value among `Y_STATEATPOWERON_UNCHANGED`, `Y_STATEATPOWERON_A` and `Y_STATEATPOWERON_B` corresponding to the state of the relays at device startup (A for the idle position, B for the active position, UNCHANGED for no change)

On failure, throws an exception or returns `Y_STATEATPOWERON_INVALID`.

relay→get_userData() YRelay
relay→userData()

Returns the value of the userData attribute, as previously stored using method `set_userData`.

```
js      function get_userData( )
nodejs  function get_userData( )
php     function get_userData( )
cpp     void * get_userData( )
m       -(void*) userData
pas     function get_userData( ): Tobject
vb      function get_userData( ) As Object
cs      object get_userData( )
java    Object get_userData( )
py      def get_userData( )
```

This attribute is never touched directly by the API, and is at disposal of the caller to store a context.

Returns :
the object stored previously by the caller.

relay→isOnline() YRelay

Checks if the relay is currently reachable, without raising any error.

```
js      function isOnline( )
nodejs  function isOnline( )
php     function isOnline( )
cpp     bool isOnline( )
m       -(BOOL) isOnline
pas     function isOnline( ): boolean
vb      function isOnline( ) As Boolean
cs      bool isOnline( )
java    boolean isOnline( )
py      def isOnline( )
```

If there is a cached value for the relay in cache, that has not yet expired, the device is considered reachable. No exception is raised if there is an error while trying to contact the device hosting the relay.

Returns :

`true` if the relay can be reached, and `false` otherwise

relay→isOnline_async() YRelay

Checks if the relay is currently reachable, without raising any error (asynchronous version).

```
js      function isOnline_async( callback, context)
nodejs  function isOnline_async( callback, context)
```

If there is a cached value for the relay in cache, that has not yet expired, the device is considered reachable. No exception is raised if there is an error while trying to contact the device hosting the requested function.

This asynchronous version exists only in Javascript. It uses a callback instead of a return value in order to avoid blocking the Javascript virtual machine.

Parameters :

callback callback function that is invoked when the result is known. The callback function receives three arguments: the caller-specific context object, the receiving function object and the boolean result

context caller-specific object that is passed as-is to the callback function

Returns :

nothing : the result is provided to the callback.

relay→load() YRelay

Preloads the relay cache with a specified validity duration.

```
js      function load( msValidity)
nodejs  function load( msValidity)
php     function load( $msValidity)
cpp     YRETCODE load( int msValidity)
m       -(YRETCODE) load : (int) msValidity
pas     function load( msValidity: integer): YRETCODE
vb      function load( ByVal msValidity As Integer) As YRETCODE
cs      YRETCODE load( int msValidity)
java    int load( long msValidity)
py      def load( msValidity)
```

By default, whenever accessing a device, all function attributes are kept in cache for the standard duration (5 ms). This method can be used to temporarily mark the cache as valid for a longer period, in order to reduce network trafic for instance.

Parameters :

msValidity an integer corresponding to the validity attributed to the loaded function parameters, in milliseconds

Returns :

YAPI_SUCCESS when the call succeeds. On failure, throws an exception or returns a negative error code.

relay→load_async() YRelay

Preloads the relay cache with a specified validity duration (asynchronous version).

```
js      function load_async( msValidity, callback, context)
nodejs  function load_async( msValidity, callback, context)
```

By default, whenever accessing a device, all function attributes are kept in cache for the standard duration (5 ms). This method can be used to temporarily mark the cache as valid for a longer period, in order to reduce network trafic for instance. This asynchronous version exists only in Javascript. It uses a callback instead of a return value in order to avoid blocking the Javascript virtual machine.

Parameters :

msValidity an integer corresponding to the validity of the loaded function parameters, in milliseconds

callback callback function that is invoked when the result is known. The callback function receives three arguments: the caller-specific context object, the receiving function object and the error code (or YAPI_SUCCESS)

context caller-specific object that is passed as-is to the callback function

Returns :

nothing : the result is provided to the callback.

relay→nextRelay() YRelay

Continues the enumeration of relays started using `yFirstRelay()`.

```
js      function nextRelay( )
nodejs  function nextRelay( )
php     function nextRelay( )
cpp     YRelay * nextRelay( )
m       -(YRelay*) nextRelay
pas     function nextRelay( ): TYRelay
vb      function nextRelay( ) As YRelay
cs      YRelay nextRelay( )
java    YRelay nextRelay( )
py      def nextRelay( )
```

Returns :

a pointer to a `YRelay` object, corresponding to a relay currently online, or a `null` pointer if there are no more relays to enumerate.

relay→pulse() YRelay

Sets the relay to output B (active) for a specified duration, then brings it automatically back to output A (idle state).

```
js      function pulse( ms_duration)
nodejs  function pulse( ms_duration)
php     function pulse( $ms_duration)
cpp     int pulse( int ms_duration)
m       -(int) pulse : (int) ms_duration
pas     function pulse( ms_duration: LongInt): integer
vb      function pulse( ByVal ms_duration As Integer) As Integer
cs      int pulse( int ms_duration)
java    int pulse( int ms_duration)
py      def pulse( ms_duration)
cmd     YRelay target pulse ms_duration
```

Parameters :

ms_duration pulse duration, in millisecondes

Returns :

YAPI_SUCCESS if the call succeeds.

On failure, throws an exception or returns a negative error code.

relay→registerValueCallback() YRelay

Registers the callback function that is invoked on every change of advertised value.

```
js      function registerValueCallback( callback)
nodejs  function registerValueCallback( callback)
php     function registerValueCallback( $callback)
cpp     int registerValueCallback( YRelayValueCallback callback)
m       -(int) registerValueCallback : (YRelayValueCallback) callback
pas     function registerValueCallback( callback: TYRelayValueCallback): LongInt
vb      function registerValueCallback( ) As Integer
cs      int registerValueCallback( ValueCallback callback)
java    int registerValueCallback( UpdateCallback callback)
py      def registerValueCallback( callback)
```

The callback is invoked only during the execution of `ySleep` or `yHandleEvents`. This provides control over the time when the callback is triggered. For good responsiveness, remember to call one of these two functions periodically. To unregister a callback, pass a null pointer as argument.

Parameters :

callback the callback function to call, or a null pointer. The callback function should take two arguments: the function object of which the value has changed, and the character string describing the new advertised value.

relay→set_logicalName() YRelay
relay→setLogicalName()

Changes the logical name of the relay.

```
js      function set_logicalName( newval)
nodejs  function set_logicalName( newval)
php     function set_logicalName( $newval)
cpp     int set_logicalName( const string& newval)
m       -(int) setLogicalName : (NSString*) newval
pas     function set_logicalName( newval: string): integer
vb      function set_logicalName( ByVal newval As String) As Integer
cs      int set_logicalName( string newval)
java    int set_logicalName( String newval)
py      def set_logicalName( newval)
cmd     YRelay target set_logicalName newval
```

You can use `yCheckLogicalName()` prior to this call to make sure that your parameter is valid. Remember to call the `saveToFlash()` method of the module if the modification must be kept.

Parameters :

newval a string corresponding to the logical name of the relay.

Returns :

`YAPI_SUCCESS` if the call succeeds. On failure, throws an exception or returns a negative error code.

relay→set_maxTimeOnStateA() YRelay
relay→setMaxTimeOnStateA()

Sets the maximum time (ms) allowed for $THEFUNCTIONS$ to stay in state A before automatically switching back in to B state.

```
js      function set_maxTimeOnStateA( newval)
nodejs  function set_maxTimeOnStateA( newval)
php     function set_maxTimeOnStateA( $newval)
cpp     int set_maxTimeOnStateA( s64 newval)
m       -(int) setMaxTimeOnStateA : (s64) newval
pas     function set_maxTimeOnStateA( newval: int64): integer
vb      function set_maxTimeOnStateA( ByVal newval As Long) As Integer
cs      int set_maxTimeOnStateA( long newval)
java    int set_maxTimeOnStateA( long newval)
py      def set_maxTimeOnStateA( newval)
cmd     YRelay target set_maxTimeOnStateA newval
```

Use zero for no maximum time.

Parameters :

newval an integer

Returns :

YAPI_SUCCESS if the call succeeds.

On failure, throws an exception or returns a negative error code.

relay→set_maxTimeOnStateB() YRelay
relay→setMaxTimeOnStateB()

Sets the maximum time (ms) allowed for $THEFUNCTIONS$ to stay in state B before automatically switching back in to A state.

```
js      function set_maxTimeOnStateB( newval)
nodejs  function set_maxTimeOnStateB( newval)
php     function set_maxTimeOnStateB( $newval)
cpp     int set_maxTimeOnStateB( s64 newval)
m       -(int) setMaxTimeOnStateB : (s64) newval
pas     function set_maxTimeOnStateB( newval: int64): integer
vb      function set_maxTimeOnStateB( ByVal newval As Long) As Integer
cs      int set_maxTimeOnStateB( long newval)
java    int set_maxTimeOnStateB( long newval)
py      def set_maxTimeOnStateB( newval)
cmd     YRelay target set_maxTimeOnStateB newval
```

Use zero for no maximum time.

Parameters :

newval an integer

Returns :

YAPI_SUCCESS if the call succeeds.

On failure, throws an exception or returns a negative error code.

relay→set_output() YRelay
relay→setOutput()

Changes the output state of the relays, when used as a simple switch (single throw).

```
js      function set_output( newval)
nodejs  function set_output( newval)
php     function set_output( $newval)
cpp     int set_output( Y_OUTPUT_enum newval)
m       -(int) setOutput : (Y_OUTPUT_enum) newval
pas     function set_output( newval: Integer): integer
vb      function set_output( ByVal newval As Integer) As Integer
cs      int set_output( int newval)
java    int set_output( int newval)
py      def set_output( newval)
cmd     YRelay target set_output newval
```

Parameters :

newval either `Y_OUTPUT_OFF` or `Y_OUTPUT_ON`, according to the output state of the relays, when used as a simple switch (single throw)

Returns :

`YAPI_SUCCESS` if the call succeeds.

On failure, throws an exception or returns a negative error code.

relay→set_state() YRelay
relay→setState()

Changes the state of the relays (A for the idle position, B for the active position).

```
js      function set_state( newval)
nodejs  function set_state( newval)
php     function set_state( $newval)
cpp     int set_state( Y_STATE_enum newval)
m       -(int) setState : (Y_STATE_enum) newval
pas     function set_state( newval: Integer): integer
vb      function set_state( ByVal newval As Integer) As Integer
cs      int set_state( int newval)
java    int set_state( int newval)
py      def set_state( newval)
cmd     YRelay target set_state newval
```

Parameters :

newval either Y_STATE_A or Y_STATE_B, according to the state of the relays (A for the idle position, B for the active position)

Returns :

YAPI_SUCCESS if the call succeeds.

On failure, throws an exception or returns a negative error code.

relay→set_stateAtPowerOn() YRelay
relay→setStateAtPowerOn()

Preset the state of the relays at device startup (A for the idle position, B for the active position, UNCHANGED for no modification).

js	function **set_stateAtPowerOn**(**newval**)
nodejs	function **set_stateAtPowerOn**(**newval**)
php	function **set_stateAtPowerOn**(**$newval**)
cpp	int **set_stateAtPowerOn**(Y_STATEATPOWERON_enum **newval**)
m	-(int) setStateAtPowerOn : (Y_STATEATPOWERON_enum) **newval**
pas	function **set_stateAtPowerOn**(**newval**: Integer): integer
vb	function **set_stateAtPowerOn**(ByVal **newval** As Integer) As Integer
cs	int **set_stateAtPowerOn**(int **newval**)
java	int **set_stateAtPowerOn**(int **newval**)
py	def **set_stateAtPowerOn**(**newval**)
cmd	YRelay **target set_stateAtPowerOn newval**

Remember to call the matching module `saveToFlash()` method, otherwise this call will have no effect.

Parameters :

newval a value among `Y_STATEATPOWERON_UNCHANGED`, `Y_STATEATPOWERON_A` and `Y_STATEATPOWERON_B`

Returns :

`YAPI_SUCCESS` if the call succeeds.

On failure, throws an exception or returns a negative error code.

relay→set_userData() YRelay
relay→setUserData()

Stores a user context provided as argument in the userData attribute of the function.

```
js      function set_userData( data)
nodejs  function set_userData( data)
php     function set_userData( $data)
cpp     void set_userData( void* data)
m       -(void) setUserData : (void*) data
pas     procedure set_userData( data: Tobject)
vb      procedure set_userData( ByVal data As Object)
cs      void set_userData( object data)
java    void set_userData( Object data)
py      def set_userData( data)
```

This attribute is never touched by the API, and is at disposal of the caller to store a context.

Parameters :

data any kind of object to be stored

relay→wait_async() YRelay

Waits for all pending asynchronous commands on the module to complete, and invoke the user-provided callback function.

```
js      function wait_async( callback, context)
nodejs  function wait_async( callback, context)
```

The callback function can therefore freely issue synchronous or asynchronous commands, without risking to block the Javascript VM.

Parameters :

callback callback function that is invoked when all pending commands on the module are completed. The callback function receives two arguments: the caller-specific context object and the receiving function object.

context caller-specific object that is passed as-is to the callback function

Returns :

nothing.

20. Troubleshooting

20.1. Linux and USB

To work correctly under Linux, the the library needs to have write access to all the Yoctopuce USB peripherals. However, by default under Linux, USB privileges of the non-root users are limited to read access. To avoid having to run the *VirtualHub* as root, you need to create a new *udev* rule to authorize one or several users to have write access to the Yoctopuce peripherals.

To add a new *udev* rule to your installation, you must add a file with a name following the "`##-arbitraryName.rules`" format, in the "`/etc/udev/rules.d`" directory. When the system is starting, *udev* reads all the files with a "`.rules`" extension in this directory, respecting the alphabetical order (for example, the "`51-custom.rules`" file is interpreted AFTER the "`50-udev-default.rules`" file).

The "`50-udev-default`" file contains the system default *udev* rules. To modify the default behavior, you therefore need to create a file with a name that starts with a number larger than 50, that will override the system default rules. Note that to add a rule, you need a root access on the system.

In the `udev_conf` directory of the *VirtualHub* for Linux[1] archive, there are two rule examples which you can use as a basis.

Example 1: 51-yoctopuce.rules

This rule provides all the users with read and write access to the Yoctopuce USB peripherals. Access rights for all other peripherals are not modified. If this scenario suits you, you only need to copy the "`51-yoctopuce_all.rules`" file into the "`/etc/udev/rules.d`" directory and to restart your system.

```
# udev rules to allow write access to all users
# for Yoctopuce USB devices
SUBSYSTEM=="usb", ATTR{idVendor}=="24e0", MODE="0666"
```

Example 2: 51-yoctopuce_group.rules

This rule authorizes the "yoctogroup" group to have read and write access to Yoctopuce USB peripherals. Access rights for all other peripherals are not modified. If this scenario suits you, you

[1] http://www.yoctopuce.com/FR/virtualhub.php

only need to copy the "51-yoctopuce_group.rules" file into the "/etc/udev/rules.d" directory and restart your system.

```
# udev rules to allow write access to all users of "yoctogroup"
# for Yoctopuce USB devices
SUBSYSTEM=="usb", ATTR{idVendor}=="24e0", MODE="0664", GROUP="yoctogroup"
```

20.2. ARM Platforms: HF and EL

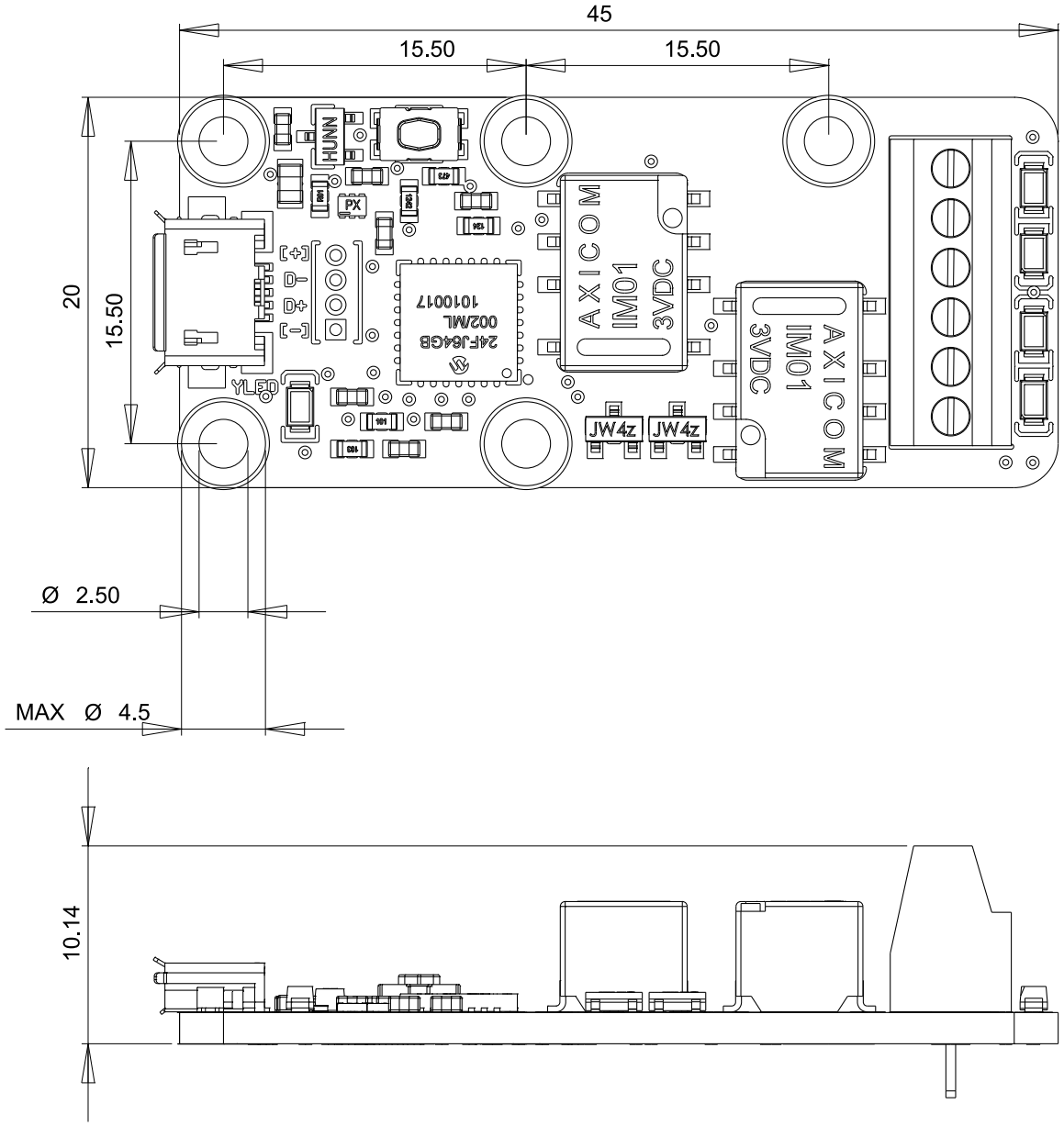
There are two main flavors of executable on ARM: HF (Hard Float) binaries, and EL (EABI Little Endian) binaries. These two families are not compatible at all. The compatibility of a given ARM platform with of one of these two families depends on the hardware and on the OS build. ArmHL and ArmEL compatibility problems are quite difficult to detect. Most of the time, the OS itself is unable to make a difference between an HF and an EL executable and will return meaningless messages when you try to use the wrong type of binary.

All pre-compiled Yoctopuce binaries are provided in both formats, as two separate ArmHF et ArmEL executables. If you do not know what family your ARM platform belongs to, just try one executable from each family.

21. Characteristics

You can find below a summary of the main technical characteristics of your Yocto-Relay module.

Width	20 mm
Length	45 mm
Weight	7 g
USB connector	micro-B
Channels	2
Max switching power	60 W
Max voltage	160 V
Supported Operating Systems	Windows, Linux (Intel + ARM), Mac OS X, Android
Drivers	no driver needed
API / SDK / Libraries (USB+TCP)	C++, Objective-C, C#, VB .NET, Delphi, Python, Java/Android
API / SDK / Libraries (TCP only)	Javascript, Node.js, PHP, Java
RoHS	yes
USB Vendor ID	0x24E0
USB Device ID	0x000C
Suggested enclosure	YoctoBox-Short-Thick-Black



All dimensions are in mm
Toutes les dimensions sont en mm

Yocto-Relay

A4

Scale
3:1
Echelle

Index

A
Access 95
Accessories 3
Activating 96
Advanced 107
Android 95, 96
Assembly 15, 16

B
Basic 63
Blueprint 223

C
C# 69
C++ 49, 54
Callback 44
Characteristics 221
CheckLogicalName, YAPI 111
Coils 16
Command 27
Compatibility 95
Components 9
Concepts 19
Configuration 12
Connections 15

D
Dangerous 9
delayedPulse, YRelay 183
Delphi 77
describe, YModule 138
describe, YRelay 184
Description 27
DisableExceptions, YAPI 112
Distribution 16
download, YModule 139
Dynamic 83

E
Electro-magnetic 16
Electrocution 9
Elements 5, 6
EnableExceptions, YAPI 113
EnableUSBHost, YAPI 114
Error 36, 47, 53, 61, 67, 74, 81, 87, 93, 105
Event 107
Examples 16

F
Files 83
Filters 44
FindModule, YModule 136
FindRelay, YRelay 181
FirstModule, YModule 137
FirstRelay, YRelay 182
Fixing 15
FreeAPI, YAPI 115
functionCount, YModule 140
functionId, YModule 141
functionName, YModule 142
Functions 110
functionValue, YModule 143

G
General 19, 27, 110
get_advertisedValue, YRelay 185
get_beacon, YModule 144
get_countdown, YRelay 186
get_errorMessage, YModule 145
get_errorMessage, YRelay 187
get_errorType, YModule 146
get_errorType, YRelay 188
get_firmwareRelease, YModule 147
get_friendlyName, YRelay 189
get_functionDescriptor, YRelay 190
get_functionId, YRelay 191
get_hardwareId, YModule 148
get_hardwareId, YRelay 192
get_icon2d, YModule 149
get_lastLogs, YModule 150
get_logicalName, YModule 151
get_logicalName, YRelay 193
get_luminosity, YModule 152
get_maxTimeOnStateA, YRelay 194
get_maxTimeOnStateB, YRelay 195
get_module, YRelay 196
get_module_async, YRelay 197
get_output, YRelay 198
get_persistentSettings, YModule 153
get_productId, YModule 154
get_productName, YModule 155
get_productRelease, YModule 156
get_pulseTimer, YRelay 199
get_rebootCountdown, YModule 157
get_serialNumber, YModule 158
get_state, YRelay 200
get_stateAtPowerOn, YRelay 201
get_upTime, YModule 159
get_usbBandwidth, YModule 160
get_usbCurrent, YModule 161
get_userData, YModule 162
get_userData, YRelay 202
GetAPIVersion, YAPI 116
GetTickCount, YAPI 117

H

HandleEvents, YAPI 118
Hazards 9
High-level 109
HTTP 44

I

InitAPI, YAPI 119
Installation 63, 69
Installing 27
Integration 54
Interface 134, 179
Introduction 1
isOnline, YModule 163
isOnline, YRelay 203
isOnline_async, YModule 164
isOnline_async, YRelay 204

J

Java 89
Javascript 31

L

Library 54, 83
Limitations 29
Linux 219
load, YModule 165
load, YRelay 205
load_async, YModule 166
load_async, YRelay 206
Localization 11

M

Module 11, 20, 21, 28, 33, 41, 51, 59, 65, 71, 79, 85, 91, 100, 134

N

Native 23, 95
.NET 63
nextModule, YModule 167
nextRelay, YRelay 207

O

Objective-C 57
Optional 3

P

Paradigm 19
Platforms 220
Port 96
Power 16
Preparation 77
PreregisterHub, YAPI 120
Prerequisites 1
Presentation 5
Programming 19, 25, 107
Project 63, 69
pulse, YRelay 208
Python 83

R

reboot, YModule 168
Reference 109
RegisterDeviceArrivalCallback, YAPI 121
RegisterDeviceRemovalCallback, YAPI 122
RegisterHub, YAPI 123
RegisterHubDiscoveryCallback, YAPI 124
RegisterLogFunction, YAPI 125
registerValueCallback, YRelay 209
Relay 22, 28, 31, 39, 49, 57, 64, 70, 77, 83, 89, 98, 179
Relays 16
revertFromFlash, YModule 169

S

saveToFlash, YModule 170
SelectArchitecture, YAPI 126
Service 23
set_beacon, YModule 171
set_logicalName, YModule 172
set_logicalName, YRelay 210
set_luminosity, YModule 173
set_maxTimeOnStateA, YRelay 211
set_maxTimeOnStateB, YRelay 212
set_output, YRelay 213
set_state, YRelay 214
set_stateAtPowerOn, YRelay 215
set_usbBandwidth, YModule 174
set_userData, YModule 175
set_userData, YRelay 216
SetDelegate, YAPI 127
SetTimeout, YAPI 128
Sleep, YAPI 129
Source 83
Start 25

T

Test 11
triggerFirmwareUpdate, YModule 176
Troubleshooting 219

U

UnregisterHub, YAPI 130
UpdateDeviceList, YAPI 131
UpdateDeviceList_async, YAPI 132

V

Variants 54
VirtualHub 95
Visual 63, 69

W

wait_async, YModule 177
wait_async, YRelay 217

Y

YAPI 111-132
yCheckLogicalName 111
yDisableExceptions 112
yEnableExceptions 113
yEnableUSBHost 114
yFindModule 136
yFindRelay 181
yFirstModule 137
yFirstRelay 182
yFreeAPI 115
yGetAPIVersion 116
yGetTickCount 117
yHandleEvents 118
yInitAPI 119
YModule 136-177
Yocto-Relay 20, 27, 31, 39, 49, 57, 63, 69, 77, 83, 89, 95
yPreregisterHub 120
yRegisterDeviceArrivalCallback 121
yRegisterDeviceRemovalCallback 122
yRegisterHub 123
yRegisterHubDiscoveryCallback 124
yRegisterLogFunction 125
YRelay 181-217
ySelectArchitecture 126
ySetDelegate 127
ySetTimeout 128
ySleep 129
yUnregisterHub 130
yUpdateDeviceList 131
yUpdateDeviceList_async 132